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NOTICES:—All communications relating to editorial matter should be addressed to the Editor, who will be pleased to consider articles or contributions dealing with modern chemical developments or suggestions bearing upon the advancement of the chemical industry in this country. Communications relating to advertisements or general matters should be addressed to the Manager.

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The Oil-from-Coal Problem

SOME time ago Sir Harry McGowan publicly stated that the technique of producing oil from coal by hydrogenation had been thoroughly mastered and that an important new industry could be introduced if the problem were approached on a national basis. That, to the ordinary citizen, might not have conveyed very much, but to anyone with inside knowledge it could mean nothing less than that the Billingham works were already able to undertake the large scale production of petrol from coal if it received the necessary national backing. More recently we have had some interesting contributions in *The Times* from Professor Donnan, Professor Brame and others that threw additional light on the subject. And now we have the further specific statement from Sir Harry McGowan that "hydrogenation has already reached the stage at which we have a plant at Billingham capable of hydrogenating 15 tons or more a day of bituminous coal." Further, we are assured that of the clean dry coal so treated some 60 per cent. by weight is recovered as refined petrol, "which has been utilised with complete success for many months past in motor vehicles of all descriptions."

It is clear from this that the chemical and engineering aspects no longer present any difficulty. What remains is the financial and commercial problem. Can this country produce synthetic petrol at a price comparable to that of natural petrol? Sir H. McGowan's answer on this point is important—"A plant to hydrogenate 1,000 tons of clean dry coal a day could produce No. 1 motor spirit and sell it at present standard retail prices with a small profit, after allowing for all costs of raw material, manufacture, repairs, obsolescence and distribution." It is not contended that such a profit would attract capital. The fact is put forward merely as an indication that the hydrogenation process has already reached a stage at which only a very slight rise in the price of petrol is required to make it a self-supporting commercial proposition. Assuming all this to be sound, two points remain. First, if the prospective financial return is not sufficient to attract private capital, who is to supply it? Secondly, how is that "very slight rise" in the price of petrol to be achieved? Probably there are answers available to these questions, and as the discussion develops no doubt they will be disclosed.

One further point that Professor Donnan makes is worth noting. The lay public are liable to get mixed up between hydrogenation and low temperature carbonisation, and it is as well, perhaps, to make clear the distinction. The hydrogenation process produces nothing but liquid fuel, converting 60 per cent. of the weight of coal treated into motor spirit. Low temperature carbonisation produces among other things tar oils, and these can be treated by hydrogenation very much as coal itself can be. But apart from this the hydrogenation process has no necessary relation to low temperature processes. What emerges in a general way from the hydrogenation controversy is the importance to the nation of possessing a huge chemical centre like Billingham-on-Tees. Established to produce synthetic nitrogen—a task it has discharged almost too successfully—it is now possessed of experience in high pressure work and in many other directions that can be turned to any purpose required. It is, indeed, as a centre of research, applied chemistry, and chemical engineering, one of our greatest national possessions.

The Faraday Centenary

THE Faraday Centenary Celebration, which will be held in London on September 21 and 22, immediately preceding the centenary meeting of the British Association, relates to Faraday's discovery of electro-magnetic induction, and from the chemical point of view will be of less interest than the celebration a few years ago of Faraday's isolation of benzene. Both, however, have one point in common—each discovery marked a starting point for a whole series of scientific and commercial developments; and although it is Faraday

the electrician who is now to be commemorated it will be difficult to separate him from Faraday the chemist. Various chemical organisation are appropriately associated with the centenary celebrations.

The centenary meeting of the British Association covers the period Wednesday, September 23 to Wednesday, September 30, and promises to be more than usually interesting. Founded in the city of York on September 26, 1831, on the initiative of Sir David Brewster, the Association will pay a visit to its own birthplace, and will hold the first meeting of its second century there in 1932. General J. C. Smuts is this year's president, and his address will be delivered on the evening of the opening day. Last year, when Professor G. T. Morgan was president of the Chemistry Section, there was a discussion of great public interest on the dyestuffs question. This year the president is General Sir Harold Hartley, whose presidential address will deal with "Michael Faraday and the theory of electrolytic conduction" and the discussions will be of a severely scientific character. Outside the section itself there are many items of directly chemical interest, such as Sir Robert Hadfield's notes on a research on Faraday's steels and alloys, Mr. W. G. Campbell on "A chemical approach to the study of wood preservation," Dr. Rosenhain on "Metals and alloys in relation to engineering progress," Sir D. Milne Watson on "The new gas industry," various contributions on fertilisers, and a visit to the I.C.I. research station at Jeolott's Hill.

Hydrofluoric Acid

THE latest chemical to travel by tank car is anhydrous hydrofluoric acid, of which the first delivery has recently been made from Easton, Pa., by the Sterling Products Co. We used to handle the commercial acid with great care, seeing that it attacked glass, and even the anhydrous product chars wood and destroys rubber, but it can be shipped in steel containers. It is made from fluorspar and sulphuric acid and boils at 19°. Fluorspar itself is assuming a place of ever increasing importance in steel manufacture with the rise of the basic open hearth process. An average of 7 or 8 lb. of fluorspar for every ton of steel is used to render the slag more fluid. The mineral is found notably in limestone rocks near zones of faulting or as a filling in cavities; apparently few districts can produce any large tonnages, and now that consumption is increasing prospecting will have to be undertaken to find future resources.

The chemical use is a surprising one, namely, for the manufacture of difluoro-dichloro-methane, a substance described by chemists of the General Motors Corporation earlier in the year as suitable as a refrigerant. At ordinary temperatures it is a gas, but can be liquefied by compression and produces cold on expansion in the normal manner. It is valuable in being non-toxic and it is in consequence expected to permit refrigeration to enter new fields, such, for example, as the cooling of bedrooms and in mines. There is much talk of refrigeration nowadays, with the advent of dry ice among other things: for our part, given a hot summer, we should be pleased to study their application in detail. The use of fluorine in such a manner is but another illustration of the chemist's skill; anhydrous hydrofluoric acid also should have many uses now that it is available cheaply and in quantity.

The Maintenance of Spending Power

SIR ERNEST BENN, in his annual address to the shareholders of Benn Brothers, Ltd., made one excellent point that may be commended to the heads of all business concerns. It was his justification of the policy of maintaining dividends wherever possible, on the grounds that the shareholder class are wise spenders and that any curtailment of their spending power must react disastrously upon retail firms and through them upon manufacturers and workpeople. In these days, as he points out, it is not difficult to find reasons for limiting distributions in the shape of dividends, but not everyone who may applaud caution of this kind would realise how a reduction of dividend means a corresponding reduction of purchases and consequently a restriction of trade the effects of which extend from point to point. Once reduce spending power and a vicious circle inevitably begins from which everybody must suffer. On the other hand, if spending power can be maintained trade is kept going and everybody gains. It requires some courage and vision in these days to follow this line, but it is the right policy for the times, and it is a real satisfaction to find the firm of Benn Brothers pursuing it and its brilliant chairman openly expounding and justifying it for the encouragement of the faint-hearted. And now, on top of this courageous policy, comes the welcome news that our national exports were better in July than in June by nearly £5,000. It is not a big advance, but it is a sign of a turn in the trade tide. And the way to confirm it is to believe in the return of prosperity and to work our hardest to achieve it.

Books Received

THE TEACHING OF APPLIED CHEMISTRY. Board of Education Pamphlet No. 85. London: H.M. Stationery Office. Pp. 55. 1s.

THE MODERN SOAP AND DETERGENT INDUSTRY. 2 vols. By Geoffrey Martin. London: Crosby Lockwood and Son. 36s. per volume.

The Calendar

Aug. 15	Mining Institute of Scotland: General Meeting. 3 p.m.	Royal Technical College, Glasgow.
Sept. 6–12	International Association for the Testing of Materials: First Congress.	Zürich.
14–15	Institute of Metals: Annual Autumn Meeting	Zürich.
18–21	Association of Special Libraries and Information Bureaux: Eighth Annual Conference.	Lady Margaret Hall, Oxford.
21–23	Royal Institution: Faraday Celebrations	London.
23–30	British Association Centenary Meeting.	London.
27	Eleventh Congress of Industrial Chemistry.	Paris.
Sept. 29–Oct 2	Iron and Steel Institute: Autumn Meeting.	Swansea.
Nov. 16–21	Third International Conference on Bituminous Coal.	Carnegie Institute of Technology, Pittsb'gh.

Benn Brothers' Annual Meeting

Turnover and Profit Margin Maintained

THE thirty-fifth annual general meeting of Benn Brothers, Ltd., was held on Friday, at Bouverie House, Fleet Street, London, E.C.

Sir Ernest J. P. Benn, Bt., C.B.E., the chairman of the company, presided.

The Chairman in moving the adoption of the report and accounts for the year ended June 30, 1931, said: Your directors do not conceal their sense of pride in presenting accounts which show substantially the same results as in recent years. There is to-day perhaps more credit in maintaining a good position than there was some years ago in the comparatively easier task of making that position. We know that things are bad and times are difficult, but I am inclined to think that things are made worse and times more difficult because of a certain readiness to accept the gloomy view. The difficulties of the times ought, one would think, to trouble our company more than most, for we are dependent upon the good will and custom of more than 100,000 trading houses whose names are entered on our ledger. Yet we have been able to maintain our turnover, and, more remarkable, to maintain our margin of profit.

Value of Trade Press Advertising

The obvious explanation is the imperative need in these days for the fullest and the best technical news and service and the general recognition by the traders of the country of the value of our publications in these respects. The news values of our advertisement pages are higher to-day than ever before, and manufacturers and merchants know from hard experience that a generous appropriation to the trade Press is the best way of arranging an advertising account. There was a time when advertising was regarded as a luxury to be enjoyed in times of prosperity. Now, with greater wisdom, it is recognised that a higher return is given for this form of expenditure than for any other form of selling effort.

What may be described as the politics of trade is sometimes more important than the practical technicalities. The right article at the right price may be useless by reason of some artificial regulation. The trade paper is the essential medium through which the business classes can secure prompt and accurate information without which they cannot carry on to-day. The weekly comments of *The Timber Trades' Journal* on the Russian situation have been a godsend to those who want to know, as well as an invaluable corrective to all the nonsense that has been written on both sides of this difficult question.

Again, serious or useful opinion upon the operations of the Electricity Commissioners or the proposals for the electrification of the railways is only possible with the aid of the editorial pages of *The Electrician*. To discuss the problems of the land before reading *The Fruit Grower* is to confess oneself a charlatan. It is impossible to understand coal without a knowledge of the revolution in the power supply of which our *Industrial Gas Supplement* is the only authoritative record, and similar claims can be made for *The Cabinet Maker, The Hardware Trade Journal, The Chemical Age, The Leather Trades' Review, The British Trade Journal*, and the rest of our trade papers.

We have in recent years made satisfactory progress with what may be described as our semi-technical department. In *Gardening Illustrated, Discovery*, and the *Nursery World* we have journals for the general public with a guarantee of technical excellence lacking in the general Press.

Dividend Policy

The figures which are before you are not in all respects as good as those which you have been in the habit of reviewing in the accounts. You will notice, for instance, on your balance sheet an entry "Work in progress." Such an item has never appeared before. We have always taken the view that we could afford to pay for work in progress when it was done and wait for the revenues until they arrived. This entry covers the costs incurred in connection with the establishment of *Industria Britânica*. It is a very proper item to put into the balance sheet, but I call your attention to it because this is not the first occasion on which we have established new enterprises, but it is the first occasion on which we have failed to write off all the costs immediately they arose.

In little ways like this we have felt that shareholders were entitled to reap the benefit of their sacrifices in the past, and to look to us to maintain our dividend. Had your directors been inclined to follow the fashion and reduce the income of shareholders, it would have been easy to do so, but the general adoption of this course seems to me to be fraught with danger. Shareholders as a class are the people who, above all others, know how to spend wisely, and the wholesale reduction of the spending power of the shareholding class which has taken place in the last 12 months has reacted disastrously upon our shopkeepers, and through them upon our manufacturers and our workpeople. We therefore came to the conclusion that we should be wise to curb our conservatism to the very small extent necessary in order to maintain our dividend.

Had this course involved any inflation, had it involved any risk, we should not, of course, have taken it. Neither does it mean that we feel safe for a similar dividend in the future, but we do feel very definitely in times like these that the best service we can render is to wait for trouble until it comes. The justice of this course is more obvious when you remember the burden of taxation. I have endeavoured to calculate the total contribution to public funds for which our business is responsible. An exact figure is difficult to get, but I am satisfied that the public revenues actually receive a larger sum from our efforts than is paid to the proprietors of the business.

"Industria Britanica"

In a year's time I shall have the privilege of discussing with you the most interesting journalistic venture since the war. Your directors have been much impressed by the enterprise which arranged for a British Empire Trade Exhibition in Argentina. We did our best to back up that cheerful evidence of the pioneering spirit in a time when all too little of that spirit was about. We despatched one of our colleagues, Mr. John A. Benn, as a special commissioner on behalf of all our journals on an extended tour of the South American continent. He provided us, as those of you who have read our journals will remember, with valuable descriptive accounts of South American markets and of the Buenos Aires Exhibition.

On the strength of his reports it was decided to establish a journal for the special purpose of facilitating intercourse between British manufacturers and South American buyers. Our plans were fortunate in securing the notice and approval of that great British commercial traveller, the Prince of Wales, and, indeed, his Royal Highness was good enough to set a new record in British trade journalism by writing the leading article for the first issue of *Industria Britânica*.

The Federation of British Industries has taken a special interest in the venture, and the first issue, dated August, 1931, is available for your inspection to-day. It is, I think, greatly to the credit of British industry that so representative a collection of our manufactured products should appear in the advertisement pages of this new paper. With all our experience of commercial publishing we have never entered upon a new departure with higher hopes or more evidence of general and influential support. *Industria Britânica*, entirely devoted to the description of British products, is printed in London in Spanish and circulated to all the responsible buyers and merchant houses in Latin America.

The motion was seconded by Mr. Gordon Robbins (deputy-chairman).

The report and accounts were adopted, and it was resolved that the following dividends be paid, less tax, on August 15, 1931: 3 per cent. on the preference shares, making, with the interim dividend, 6 per cent. for the year; 13¾ per cent. on the ordinary shares, making 20 per cent. for the year; and 2s. 9d. per share on the deferred shares, making 4s. per share for the year.

Studies in Dual Emulsions

By R. M. Woodman, M.Sc., Ph.D., F.I.C., etc.

(Cambridge University Horticultural Research Station, Cambridge)

As far back as 1921 F. E. Weston published in THE CHEMICAL AGE *an account of dual emulsions obtained with a clay as emulsifier, and his paper has been a fruitful source of discussion. The author, who incidentally has confirmed Weston's results for various clays, now gives some account of the latest phases of dual emulsion work.*

IT is the generally accepted belief that an emulsifier is capable of promoting one type of emulsion only with any two given liquids to be emulsified.(1) Many exceptions—apparent at least—to this have been discovered in practice, Robertson (2), Weston (3), Seifriz (4), Woodman (5), Mead and McCoy (6) and Tartar, Duncan, Shea and Ferrier (7) having demonstrated that in various systems the dual types can be obtained with certain pairs of liquids and a given emulsifier without the addition of substances such as electrolytes to the system.

In most cases dual emulsions have been obtained by altering the phase-volume ratio; but the formation of two types of emulsion in a system by manipulation of the phase-volume ratio postulates the existence of a ratio common to both types and, for some systems at this common phase-volume ratio, emulsions have been inverted by reshaking on ageing (4, 5) or the dual types have been prepared by differing mechanical treatments (5). The exceptions referred to try the validity of the opinion quoted; many factors, however, might operate to cause these peculiar results without any invalidation of this ruling.

Interaction between Emulsifier and Liquid Phases

Probably the main factor is the possibility of chemical action between emulsifier and one or both liquid phases resulting in the presence of alternative emulsifiers in the system. Such an interaction between the emulsifier and the liquids implies a certain specificity of the liquid phases used—not only for the non-aqueous phase, but may be for the (usual) aqueous phase of an emulsion system.

In the past the specific action of the emulsifier itself has been the chief consideration, one emulsifier being quoted as giving *one* type only with any two given liquids, a different emulsifier apparently being necessary—according to simple thermodynamic reasonings—to yield the opposite type with the same two liquids. It is being recognised now, however, that the chemical and physical natures of the liquid phases are quite as important as the nature of the emulsifier.

Thus, taking the system oil-emulsifier-water, and varying the oil only, two simple possibilities may be distinguished: (*a*) The employment of different oils may result in emulsions all of the same type but of widely-varying degrees of completeness and stability; this must have been implicitly accepted by most experimenters on emulsion formation and has been clearly stated by Kernot and Knaggs (8) and by Woodman and Taylor (9). (*b*) The employment of different oils or a mixture of oils may result in opposite types of emulsions. Specificity of this kind has been clearly recognised by Woodman (5), Woodman and Taylor (9, 10) and Tartar, Duncan, Shea and Ferrier (7). A good illustration of this is given by Woodman and Taylor (10): a 1 per cent. aqueous suspension of a lignitic clay from Czecho-Slovakia gave, so far as could be ascertained, OW* types only with petroleum ether (boiling range 100°–120° C.), and WO* types only when the oil was oleic acid, linseed or olive oils. Subconsciously, possibility (*b*) must also have been recognised by Seifriz (4) when he attributed the inversion of an aged emulsion on reshaking to the heterogeneity of composition of the petroleum oil used.

These two possibilities need in no way conflict with the generally accepted opinion on emulsification, for the two liquids to be emulsified are a different pair in each system, exhibiting, therefore, different relative degrees of wetting for the emulsifier. (Unless, of course, the belief is also held that an aqueous suspension or a pseudo-solution of a given emulsifier can promote one type of emulsion only with *any* immiscible liquid, and this extended belief in the specific nature of an emulsifier must be prevalent until possibility (*b*) is accepted.) Thus possibility (*a*) could most probably be explained by varying degrees of wetting (or solubility) of the emulsifier by the different oils, and possibility (*b*) in the same manner, or by interaction of oil and emulsifier in certain cases to yield, either wholly or in large excess, an alternative emulsifier favouring the opposite type of emulsion.

Examples of the simple possibility (*b*) are rare (10); it usually happens, when a given aqueous medium such as gelatine solution (5), generally taken to be an OW emulsifying medium, is found to yield with an exceptional oil such as the cresols (5) the opposite type for some reason, that this exceptional system then yields *both* types.

Some Possible Explanations

As has been outlined before, an obvious explanation of this in accord with the present theory of emulsification is that the oil and the emulsifier interact chemically to provide a new emulsifier yielding the opposite type. If this interaction is complete (it must be remembered that the liquid phases usually greatly exceed in amount the emulsifier) then none of the original emulsifier will be left, and the system would yield only that type opposite to the one usually given by the original emulsifier. If, however, the interaction is incomplete, then at least two emulsifiers—one the original—will be simultaneously present in the system, resulting in dual types, an excess of the oil phase naturally favouring the WO emulsifier and *vice-versa*. At the phase-volume ratio common to both types, where a kind of critical equilibrium of emulsifiers would thus exist, mechanical treatment, by aiding or impeding the use of one emulsifier, would govern the type of emulsion formed, though this emulsion might invert on subsequent reshaking (5). Alternatively, in either of these cases, such an interaction might mean the conversion of all or part of the original emulsifier into a new emulsifier yielding the same type as the original, an opposite type or dual types not occurring then, of course; this would afford an additional explanation of possibility (*a*), for new emulsifiers so formed may be poorer or better than the original one, whilst giving the same type.

The emulsifiers present in a system may thus be the original (solid) emulsifier, original solid emulsifier as modified by the presence of water, emulsifier compound or compounds got by interaction with the non-aqueous phase, new emulsifiers yielded by chemical interaction of one or both phases with hydrolytic or breakdown products of the emulsifier (10) and the residues remaining from such hydrolyses or breakdowns(10). These are all possible complications in an emulsion system; and it would seem—possibly contrary to the general notion—that by far the simplest systems to explain are those in which the emulsifier consists of finely-divided (inert) particles (*e.g.*, carbon, silica, etc.), grain size and wettability—physical characteristics—providing sufficient explanation for the type and character of emulsions formed.

Another explanation of the formation of dual types in a system by an emulsifier may be summarised under a usual but very vague phrase: "alteration in colloidal properties or state." Thus a gelatine solution is known to "age," and ageing has some effect on the type of emulsion formed with cresylic acid (5) and on ease of emulsification (11); again, an oil may alter the pH (and, presumably, "colloidal properties") of the aqueous emulsifying medium; or a colloid may be present in the aqueous medium in different states of aggregation (simple molecules with a substance of high molecular weight such as gelatine, molecules in varying degrees of association, and clusters of these), and ignorance must be confessed as to whether or not these different "colloidal states" have essentially different identities, what their relation is to the colloid in the dry state, and, in particular, what the variations in emulsifying action are.

A third explanation may be given to account for the behaviour of such a dual system. It is difficult to imagine definite chemical action between certain oils and emulsifiers (thus Cooper *et alia*, in a long and exhaustive series of researches (12) have failed to prove definite chemical action between phenols and proteins). In these circumstances a tentative hypothesis has been formulated that the formation

* OW = oil-in-water, and WO = water-in-oil, types of emulsion.

of the two types in such systems might be due to the differing degrees of solubility of the emulsifier in the two liquid phases(5). This necessarily introduces the conception of a partition of emulsifier between the two phases, and the partition has been determined for one system (13). The existence of two partition coefficients—one presumably of a temporary and unstable nature (5)—due to the mechanics of preparation at the common phase-volume ratio was not demonstrated experimentally; it has been shown, however, that such a difference might be negligible when measured by ordinary chemical methods (5).

Differences in Partition

Differences in partition of emulsifier could also easily account for possibilities (*a*) and (*b*) relating to the "specificity" of oils; thus an emulsifier B would be differently distributed between the pairs A_1 and C, and A_2 and C, where C is water, and A_1 and A_2 are different oils (9).

It is worthy of note that Bancroft (14), in attempting to explain Robertson's result, where sodium oleate solution yielded two types with olive oil, stated that the solubility of soap in olive oil at high concentrations of oil might prove a more important factor than the water solubility. This is essentially the same hypothesis as the author's; and it will be found that in many apparently inexplicable systems the emulsifier is soluble to some type of solution—true or colloidal—in both phases; the emulsifier is then wetted by both liquid phases (5, 13).

Confirmation of the author's hypothesis has also recently been obtained by Wellman and Tartar (15). These writers, who have apparently inadvertently passed over a series of papers by the present author on this subject, state in their summary that "the distribution of soap emulsifiers between the immiscible phases of emulsions is a type-determining factor of such systems" and that "distribution of soap is controlled by factors influencing solubility and wettability, such as temperature, phase-volume relationships, mechanical treatment," etc. This is valuable evidence for a particular instance of the present author's hypothesis.

The assumption of solubility of emulsifier in both phases—wetting being regarded as a limiting case—as the cause of the formation of dual types in a given system might at first sight appear to contradict the accepted notion concerned with the specificity of the emulsifier. This is not necessarily so: for the *relative masses* of an emulsifier dissolved in—and, therefore, wetted by—the two liquid phases (depending on the phase-volume ratio employed) must surely play a large part (which can be labelled "preferential wetting") in determining type without any departure from the above notion, which is itself derived from the fact that that liquid which preferentially wets the emulsifier is the continuous phase of an emulsion system. At the phase-volume ratio common to both types, *one* type has always been found of a temporary nature (though not necessarily unstable if left untouched), inverting on ageing and reshaking to the permanent (though not necessarily stable) type; this indicates that a false partition obtains for the temporary type, *i.e.*, that by certain mechanical treatment the masses of emulsifier wetted by the two phases have been temporarily altered.

Alternatively or additionally, as already pointed out (5, 13), solution of a colloid emulsifier in either phase might result in the formation of those ill-defined complexes which are usually ignored in partition experiments; if this be the case, then the solubility and chemical interaction hypotheses would be practically identical and in accord with present notions of emulsification provided these obscure complexes could act as specific, independent emulsifiers. This step, however, cannot be bridged until more knowledge of solute-solvent complexes is obtained, and hence the solubility hypothesis must rank, temporarily at least, as an independent formulation.

Summary

Attention is drawn to the fact that the oil in an emulsion system is an important factor in determining the completeness and stability of the emulsion, and, often, even in determining the type. In the past the specific nature of the emulsifier alone has been recognised, but it is necessary, evidently, to take into account also the specificity of the oil employed.

In some systems dual types can be formed according to the phase-volume ratio employed, a phase-volume ratio common to both types existing where the mechanical method of preparation governs the type formed. Two main hypotheses which might explain this behaviour are (*a*), that the emulsifier forms alternative emulsifiers—at least to some extent—by combination with one or both liquid phases, thus favouring in some circumstances emulsions opposite in type to those usually yielded in that system by the emulsifier, and, (*b*), that the solubility (or wetting) of the emulsifier by the two liquid phases must be taken into account, introducing the conception of the partition of the emulsifier between the phases. This second hypothesis could possibly be identified with the first if knowledge of solution and of solute-solvent complexes were more advanced; as it is, the second hypothesis must be regarded as independent.

(1) Clayton: *Emulsions and Their Technical Treatment*, 31 (1928).
(2) Robertson: *Koll. Zeits.*, **7**, 7 (1910).
(3) Weston: CHEMICAL AGE, **4**, 604, 638 (1921).
(4) Seifriz: *J. Phys. Chem.*, **29**, 587, 738, 834 (1923).
(5) Woodman: *Ibid*, **30**, 658 (1926); **33**, 88 (1929); Woodman and Wiley: *J. Soc. Chem. Ind.*, **50**, 187T (1931).
(6) Mead and McCoy: *Colloid Sympos. Monog.*, **4**, 54 (1926).
(7) Tartar, Duncan, Shea and Ferrier: *J. Phys. Chem.*, **33**, 435 (1929).
(8) Kernot and Knaggs: *J. Soc. Chem. Ind.*, **47**, 96T (1928).
(9) Woodman and Taylor: *Ibid*, **48**, 121T (1929).
(10) Woodman and Taylor: *J. Phys. Chem.*, **34**, 299 (1930).
(11) Woodman: *J. Agri. Sci.*, **17**, 44 (1927); *J. Pomology and Hort. Sci.*, **4**, 95 (1925).
(12) Cooper *et alia*: *Biochem. J.*, 1912, *et seq.*; *J. Phys. Chem.*, 1926, *et seq.*
(13) Woodman and Gallagher: *J. Phys. Chem.*, **33**, 1097 (1929).
(14) Bancroft: *ibid.*, **16**, 746 (1912); Clayton, *op. cit.*, p. 49, *et seq.*
(15) Wellman and Tartar: *J. Phys. Chem.*, **34**, 379 (1930).

New Uses for Aluminium

Result of International Competition

AT the beginning of this year the European producers of aluminium organised a competition in which prizes were offered for suggestions designed to develop the use of aluminium and its alloys. It is now announced that the committee of judges have awarded a prize of 25,000 French francs to Mr. Constantin Szmukler, 1 Rue Chaper, Grenoble (Isere), France, for a contribution on the use of aluminium in leather dressing and tanning, whilst a second prize of 25,000 French francs has been divided equally between Dr. H. Hampel, Elsasserstrasse 15, Pojeduch, b. Stettin, Germany, and Mr. de Haes, 3 Rue de Veeweyde, Bruxelles-Midi, Belgium, for two entries relating to the use of aluminium in radiators for central heating systems. The special prize of 50,000 francs has not been awarded, the judges being of the opinion that no suggestion made was of sufficient importance and exceptional novelty to justify this award.

This competition aroused great interest in technical circles in the majority of countries. Approximately 1,000 persons approached the International Aluminium Bureau for information on the competition, and eventually 291 entries were submitted to the judges. For the most part these entries showed careful study of the properties of the light metals.

British Manufacturers' Funds in Australia

THE Federation of British Industries has received a cablegram from their representatives in Australia, the Australian Association of British Manufacturers, dealing with the question of trade funds invested in Australian Government Loans. It appears that when the Treasury recently asked holders of these stocks to advise their banks of the amount held, the resultant disclosure amounted to only £2,500,000, whereas it is believed that there is at least £4,000,000 involved. It is assumed that some manufacturers have for some reason failed to comply with the Treasury's request, and they are now being urgently pressed to do so, because, unless a full return is obtained, it is possible that the short-dated Conversion Loan may be inadequate for the requirements. The Australian Association of British Manufacturers states that the information will be treated as confidential by the banks, and that the grand totals only will be disclosed. Monies on deposit in Australia are not affected.

Paint as a Protective Medium for Iron and Steel

By Ernest S. Hedges

This article discusses some aspects of the function of a film of paint in the protection of iron and steel against corrosion. The points raised have considerably influenced the composition of many modern paint products.

It is well known that ordinary paints are generally complex mixtures containing (*a*) a drying oil, such as tung oil or linseed oil, which on exposure to the air dries to a gelatinous substance, thereby forming a more or less impervious film over the metal; (*b*) a drier, which is generally an oxide of manganese, cobalt or some other metal exhibiting different stages of oxidation which catalyses the drying process of the oil; (*c*) the pigment which may be red lead, lead chromate, ferric oxide, barium sulphate, or one or more of numerous other coloured substances, which not only provides the colour and prevents the iron surface from being seen through the gelatinous film, but also serves to prevent the film from cracking on drying; and (*d*) a thinner, such as turpentine, the chief function of which is to permit the easy spreading of the paint.

In so complex a system the factors affecting the corrosion of the underlying ironwork are necessarily complicated. Electrochemical considerations are applicable, but the colloidal properties of the paint film have also to be kept in mind. Further, the properties of the pigment itself must be considered, for some have oxidising properties and may, therefore, render iron passive by forming a protective oxide film. Even the shape of the particles of pigment has its effect in preventing the access of moisture to the metal. The amount of the thinner affects the permeability of the paint film after the thinner has evaporated off. On the whole, it will be seen, therefore, that a large number of factors must be considered before the suitability of a given paint for a particular purpose can be determined. As Evans pointed out (*J. Soc. Chem. Ind.*, 1930, **49**, 173T) "the practice of bestowing care on the analysis of the metal and leaving the mixing of the paint in unscientific hands is illogical and wasteful." Considerable research has, therefore, been directed towards improving the appearance of the coating, not only in respect of colour, but also in smoothness and gloss. From the economic point of view, it is far better to consider the protective value of the paint on the underlying material, and where this is iron or steel the problem can be brought to a successful issue only by a thorough understanding of the principles involved. More co-operation between chemists engaged in the paint industry and those experienced in corrosion problems would probably have far-reaching beneficial results.

Adherence of the Paint Film

Unless the pigment consists wholly or partly of a powdered metal, such as zinc, aluminium, or "bronze," or contains graphite, it is normally a non-conductor of electricity, and hence takes no active part in electrochemical corrosion. Disregarding for the moment any passivating action of the pigment, the dried, gelatinous film of paint acts by excluding corrosive materials from the surface of the iron. It must, therefore, be capable of forming a uniformly continuous film over the metal surface, and must not crack on drying. A good paint will fulfil these requirements, but the relatively soft film is easily scratched, so that in service a paint film can scarcely be expected to remain perfectly continuous for long. Exposed parts at scratches are not subject to the relatively violent anodic attack of similar areas which are adjacent to films of cathodic metals, such as copper or nickel, and are self-healing to some extent in the absence of other electrochemical action, acquiring a skin of rust, which, under these conditions is somewhat protective, since there is no exposed cathodic part to which oxygen can continuously be supplied.

The adherence of the paint film to the metal is naturally an important factor, depending not only on the paint, but also on the surface of the metal. For mechanical reasons, a paint will usually adhere better to a rough than to a smooth surface. For this reason, it is often best first to apply a protective coating of oxide or phosphate and then to cover with a coating of paint. This brings up the question of the advisability of leaving scale on iron and steel before painting, a matter which is still in some doubt. The complete removal of scale is a laborious and time-consuming operation and is therefore to be avoided unless absolutely essential. It is quite clear, however, that all *loose* scale must be removed, as it will sooner or later peel off, and with it the paint. The remaining scale, provided it is dry and adherent, is probably harmless, and Friend (*Carn. Schol. Mem.*, 1913, **5**, 8) recommends its presence as giving a better grip for the paint.

Osmotic pressure may in certain cases cause the local failure of a paint film, as suggested by Bartell and van Loo (*Ind. Eng. Chem.*, 1925, **17**, 925, 1051). Electrolytes below the hardened paint film, perhaps enclosed in corrosion products, may cause water to be driven through the film by osmotic pressure, resulting in an increase in volume, which causes blistering of the film.

Functions of the Paint Film

One of the chief functions of the paint film is to exclude moisture and thus to prevent the electrochemical processes which produce ordinary rusting. Water must be excluded from the start, therefore, and the presence of films of moisture due to rain or dew should be avoided by painting under favourable weather conditions, and at a suitable time of the day. If the iron is already rusted it is more likely to retain moisture at its surface. The dried paint film should be impermeable to water, a property which will increase with the thickness of the film. The permeability will depend largely on the vehicle, and may vary considerably with the conditions of service. The film must be regarded as a colloidal gel, which, like films of gelatin or collodion, tends to swell in some solvents or in solutions of various electrolytes. The swollen film is soft and is easily rubbed off, and it will be permeable to the solution in which swelling occurs.

The principles of colloid chemistry provide scope for the choice of vehicles for paints which are exposed to liquids. The particles of pigment also have some influence on the permeability of the paint film; plate-like particles become oriented in a plane parallel with the surface of the metal, when applied by brushing, and the layer thus produced not only ensures greater mechanical strength, but causes any diffusing material to follow a devious path through the gelatinous medium between the particles of pigment. In addition to its waterproofing qualities, impermeability to anions is an important property of the paint film, particularly when the structure has to be exposed to sea-water. To expect a film to be impermeable to small ions like the chloride ion, however, is perhaps too optimistic.

The penetration of water through paint films has been measured by Stanley (*S. African J. Sci.*, 1928, **25**, 111) by determining the change in the electrical conductivity of the film of paint. A painted plate of metal is made the electrode of an electrolytic cell. If the circuit is maintained for 10 to 15 minutes, paint which has been penetrated by water peels off, owing to the liberation of gaseous hydrogen between the layer of paint and the surface of the metal. Of the paints examined, none was really waterproof for long, and after stripping off the paint it was found that rusting had occurred to a greater or less extent in every case. A cellulose lacquer almost entirely prevented rusting.

Protective Effect of Pigment

Pigments, which are oxidising agents, have the opportunity of conferring extra protection on the underlying iron by producing a passive layer at the surface. Among these are red lead and certain chromate pigments. Red lead is an ideal priming coat for iron and there is little doubt that its recognised protective properties are to be ascribed to its passivating influence. The mechanical properties of the red lead layer are not good, and it is usual to cover this film with a layer of another paint chosen for its mechanical properties, such as ferric oxide or aluminium. Aluminium paint is also excellent for this purpose, as the flat scales of metal form a hard, compact layer, which has the usual resistance of aluminium to atmospheric influences. When aluminium paint is applied directly to iron, without the intermediate layer of red lead, it is in electrical contact and on exposure the aluminium becomes the anode. The iron is thereby cathodically pro-

tected, but the layer of paint suffers. There is thus a double advantage in the successive application of red lead and aluminium paints to iron.

There are several " bronze " paints, which, though excellent in their legitimate use, may intensify corrosive attack when applied directly to iron which is exposed, for example, to chloride solutions. The particles of paint are cathodic to the iron. Zinc paint, on the other hand, gives a layer which is anodic and corrodes preferentially to iron, just as the zinc on a galvanised iron sheet does, and is sometimes applied for that purpose. An objection to graphite paints is sometimes raised on the ground that the graphite acts cathodically to the iron and stimulates corrosion.

Effect of Corrosion Products

If the paint film is somewhat porous and has no protective value as a passivating agent, it will certainly retard corrosion by reducing the rate of diffusion of oxygen, water, and electrolytes to the underlying iron, but in time corrosion is bound to occur through the usual processes. The corrosive agents, having penetrated the colloidal film, produce rust between the metal surface and the layer of paint. The rusting process involves a considerable increase of volume, tending to push the paint film away from the iron surface, and unless the paint has an extraordinary elasticity, failure of the film is bound to result. On the other hand, where, through perforations or scratches in the layer of paint, normal rusting has occurred without the penetration of the film, excrescences of rust may form outside the paint and interefere very little with its adherence.

There is, however, another quite distinct effect of corrosion products on the paint. It has already been shown that the formation of rust is a secondary reaction, the initial products in the presence of an aqueous solution of a sodium salt, for example, being a ferrous salt at the anodic areas and sodium hydroxide at the cathodic areas. Evans (*Trans. Amer. Electrochem. Soc.*, 1929, **55**, 243) has shown that this cathodically produced alkali may have a very important influence on the paint film, as in many cases it causes the colloidal constituents to swell or become peptised. Consequently, even if the contact with the metal is not loosened by the action of the alkali, the film is rendered very soft and easily peels on rubbing. Alkali tends to creep between the metal and the paint, and the area thus adversely affected may become large. The degree of " alkaline peeling " will depend on the conditions of exposure and on the colloidal properties of the paint vehicle.

Exhibition of Modern Optical Instruments

A LOAN exhibition of modern British optical instruments is to take place in the Science Museum, South Kensington, at the time of the British Association Centenary meeting, and apparatus has been lent by a number of leading manufacturers in this country. The display will be on view from August 28 to October 31, in the optical instrument gallery, and popular demonstrations will take place at intervals. About 100 exhibits have been provisionally selected, including binoculars, rangefinders, photographic and microscopic objectives, projection-microscopes, and surveying instruments. Aerial cameras, microphotometers, spectrographs, and a cinema projector are among the developments of optical technique to be illustrated, and a strain-viewer will demonstrate the differences and flaws to be observed in various everyday objects of glass.

Dyestuff Licences in July

THE following statement relating to applications for licences under the Dyestuffs (Import Regulation) Act, 1920, made during July has been furnished to the Board of Trade by the Dyestuffs Advisory Licensing Committee :—

The total number of applications received during the month was 539, of which 457 were from merchants or importers. To these should be added 6 cases outstanding on June 30, making a total for the month of 545. These were dealt with as follows : Granted, 514 (of which 508 were dealt with within 7 days of receipt) ; referred to British makers of similar products, 29 (of which 27 were dealt with within 7 days of receipt) ; outstanding on July 31, 2. Of the total of 545 applications received, 535, or 98 per cent., were dealt with within 7 days of receipt.

International Nitrogen Agreement

Causes of the Breakdown

THE reasons for the failure to renew the International Nitrogen Agreement are shortly summarised by a *Times* correspondent. The agreement was entered into in July, 1930, for one year, between the synthetic producers of Germany, France, Belgium, Holland, Italy, Great Britain, Poland, and Czechoslovakia, on the one hand, and the Chilean nitrogen industry, on the other, to regulate the production and consumption in the world market. Negotiations for a fresh agreement when this lapsed, however, broke down. Chilean interests put the blame for the failure on Germany and others, but articles now appearing in German papers state that the impression which has got abroad that the breakdown was due to the attitude taken up by the German nitrogen industry as regards Chile is incorrect. The assertion that in the whole course of the negotiations no definite proposals were forthcoming from the synthetic industry is declared to be false, and it is also denied that the German Customs Decree was issued during the negotiations in order to bring pressure to bear on Chile.

It is pointed out that the representatives of the German nitrogen industry, with the concurrence of the other synthetic nitrogen producers in Europe, put forward perfectly definite proposals to the Chilean representatives many weeks ago. It was proposed that the *status quo* of the fertiliser year 1930–31 should be taken as a basis, and that Chile should thus be guaranteed the same share of the world nitrogen market, as she obtained in 1930–31. The representatives of the Chilean industry are alleged to have demanded a far greater portion of the world trade in general, and also to have claimed a share of the German market four to five times greater than the proportion they secured in 1930–31.

At Lucerne, the Chilean representatives are stated to have definitely refused to consider the written proposals put forward by the European groups. This was the cause of the breakdown of the negotiations, and it was only after this point had been reached that the German Government took the necessary protective measures to prevent the German market being over-run. Similar protective measures had already been taken by France, Poland, and Czechoslovakia.

Even after the publication of the German decree, the European groups, including Germany, renewed their offer to the Chileans to come to an agreement on the basis of the *status quo* for 1930–31. This final attempt to reconcile the views of the parties broke down, it is alleged, owing to the refusal of the Chilean representatives to engage in any further negotiations with the representatives of the German nitrogen industry.

A New Property of Neodymium

RODS of quartz, in which a compound of the rare metal neodymium had been dissolved, when heated in the Bunsen burner have been made to send out a new kind of light. This quartz was prepared by Professor R. W. Wood, of The Johns Hopkins University. When heated the rods give a light whose rainbow or spectrum does not include all the colours but is crossed by dark bands. A white-hot, incandescent wire, like those of tungsten used in the electric lamp, gives white light in which none of the possible colours is missing. The neodymium, however, has the unique property of sending out only special vibrations of its own. Light passed through cold neodymium or other rare earth compounds has these same colours removed from it. No other known substance shows this peculiar behaviour.

Overseas Trade Development Council

MR. G. M. GILLETT, M.P., Secretary to the Department of Overseas Trade, announces that in accordance with the arrangement whereby membership of the Overseas Trade Development Council is reviewed annually, the Council has been reconstituted, with effect from August 1, 1931. As in the past, special representatives of trade and industry will be invited to attend the meetings of the Council when particular trades, industries or markets are being reviewed. For this purpose there is a panel of representatives who will assist the work of the Council and will be available for informal consultations. The panel includes representatives of industry, of the co-operative societies, and of the coal, steel and textile trade unions.

Oil from Coal

The Present Position in England

We have received for publication the following important statement by Sir Harry McGowan, chairman of Imperial Chemical Industries, Ltd. :—

So much interest is being shown at the moment in the question of hydrogenating British coal into oil fuels that, as chairman of the company which has done all the large-scale work on hydrogenation in this country, I may perhaps be allowed to make the following points.

Hydrogenation has already reached the stage at which we have a plant at Billingham capable of hydrogenating 15 tons or more a day of bituminous coal. Of the clean, dry coal so treated some 60 per cent. by weight is recovered as refined petrol, which has been utilised with complete success for many months past in motor vehicles of all descriptions.

This fact, together with the experience which our associates in the recently formed International Hydrogenation Patents Co. have already had in the production of 100,000 tons a year of petrol from brown coal and brown coal tar, which experience is now fully available to us, enables me to state that :—

(1) Although high pressures and temperatures are used, our experience in the very similar technique of ammonia manufacture has enabled us to overcome satisfactorily all difficulties which have hitherto arisen.

(2) The manufacture of hydrogen is a subject on which we have unique and extensive knowledge ; neither the quantity required nor the price at which it can be produced presents any obstacle to the successful development of the hydrogenation process on an economic scale.

(3) I am quite satisfied that it is now practicable to build in this country a plant for the production of petrol from bituminous coal.

A plant to hydrogenate 1,000 tons of clean, dry coal a day could produce No. 1 motor spirit and sell it at present standard retail prices with a small profit, after allowing for all costs of raw material, manufacture, repairs, obsolescence and distribution.

It is not contended, however, that such a profit as the above would attract capital. It is mentioned as an indication of the fact that the hydrogenation process has already reached a stage at which only a very slight rise in the price of petrol is required to render it a self-supporting commercial proposition.

Professor Donnan's Views

In the course of the controversy between Professor Donnan, Professor Brame, and others, some further information is incidentally disclosed as to the present position of the hydrogenation process in this country. Professor Donnan points out that hydrogenation is not in any way inimical to development that may take place in low-temperature carbonisation. "It is, in fact," he says, "a potential ally to the low-temperature carbonisation process in general, in so far as it offers the most practical method of converting into marketable petrol and other oils the low-temperature tar produced as a by-product in the manufacture of smokeless fuel. Hydrogenation of coal produces nothing but liquid fuel, converting 60 per cent. of the weight of coal treated into motor spirit. Professor Brame states that it comes as a surprise to fuel experts to learn that 60 per cent. of the coal is so converted, but he may rest fully assured that the results obtained by Imperial Chemical Industries on a semi-commercial scale do corroborate this fact.

"I stated that for several years the Germans produced 100,000 tons (and not 100 tons, as stated by Mr. Buist) per annum of motor spirit from brown coal by the hydrogenation process. Moreover, I understand that their experts are entirely satisfied as to the technical success of the process. At the same time, low-temperature carbonisation of brown coal was developed in Germany to an extent which made available at low prices large supplies of brown coal tar, which, by requiring less hydrogen, were cheaper to convert into petrol than the brown coal itself. Not unnaturally, advantage was taken of the position to turn to the cheaper method of petrol manufacture. The present German practice of treating the tar instead of the coal is due to considerations of economy and not of technique. It must be remembered that the carbonisation of one ton of dry brown coal gives a yield of tar four times as great as that from a ton of bituminous coal. In any case, we in this country have no corresponding deposits of brown coal, no brown coal tar, and only very small supplies of bituminous low-temperature tar. The problem so far as we are concerned, therefore, confines itself at present to the hydrogenation of bituminous coal.

"But it should be clearly understood that any plant erected in this country for the hydrogenation of bituminous coal would also treat with equal facility tar produced by low-temperature carbonisation, gas works tar, and coke-oven tar. In fact, these products would naturally be bought by a hydrogenation undertaking as and when their price rendered the production of petrol from them more profitable than by the treatment of the coal itself, as has already happened in Germany.

"The main point which I was interested to stress in my previous letter was that hydrogenation had already proved itself the most efficient method of converting British coal into petrol and fuel oils. The process has now been sufficiently developed to justify the hope that no time will be lost in giving it a trial on a large commercial scale in the national interest."

Trade Conditions in Java

The Federation of British Industries has received from its correspondent in Java a report as to conditions in that island. The Java Government, he states, is carrying out a campaign of enforced economy, which has resulted, among other things, in the cancellation of a large order for locomotives, and in a 10 per cent. cut in official salaries over a certain amount. The native population is not so hardly hit, owing to good harvests, but the drop in currency in circulation shows that the tendency is to do business on the basis of barter rather than cash. Exports have dropped in the first quarter 13 per cent. in quantity and 28 per cent. in value, and imports 27 per cent. in weight and 39 per cent. in value. In the opinion of the F.B.I. correspondent the bottom has not yet been reached. Several of the larger industries are drawing on their reserves, while others are being subsidised by the State, and this state of affairs is preventing any restoration of permanent equilibrium. A note of warning is sounded to those who contemplate making a first entry into the market.

A Trade Inquiry from Canada

We have received from the British Empire Trade Corporation of Toronto, Canada, an inquiry for the names and addresses of any firms supplying ground garnet mineral for abrasive purposes.

"We have at present," the Corporation states, "an inquiry from one of the largest Canadian consumers of this mineral who is desirous of securing samples, prices, etc. Consequently, we are very anxious to determine whether or not this commodity can be purchased to advantage within the Empire."

We should be glad to hear from any readers interested in this inquiry.

Russian Chemical Claims

The claim that a Russian chemist has solved the problem of obtaining synthetic rubber is made in the announcement in Moscow that the Central Executive Committee has awarded the Order of Lenin to Professor Lebedev and Engineer Krause for this invention, while the same decoration has been conferred upon Professor Yushkevitch and the engineer Karshavin "for inventing a new method of obtaining sulphur gas." According to the Tass Agency prizes of 10,000 roubles have been awarded to Professor Yushkevitch and Professor Lebedev, and 5,000 roubles to their chief assistants.

Reduction in Quebracho Prices

Some surprise was evinced last week when it became known that the pool agreement amongst manufacturers of quebracho extract regarding production and price had been terminated, and further reductions for certain brands were announced. The quotation for ordinary makes affected has been reduced to £13 7s. 6d., while soluble is quoted at £14 7s. 6d. per ton.

The Muslim College of Science

New Chemical Laboratories

MR. ROBERT F. HUNTER, D.Sc., PH.D., D.I.C., A.R.C.S., Nizam Professor of Chemistry and Director of the Chemical Laboratories of the Aligarh Muslim University, who is at present staying in London, sends us the following interesting account of the new chemical laboratories for the Muslim College of Science, India :—

The long-felt need for a definite centre of higher education in science for the Mohammedan community of India is being met, in part at least, by the building of the new science college of the Muslim University at Aligarh. Under the scheme advanced by the new Vice-Chancellor, Nawab Masood Jung Bahadur, the separate science departments are to be housed in separate buildings, the largest of which will be the chemistry block, the plans of which have only been completed in the last few months.

The new chemical laboratories are designed to meet not only the needs of the four years B.Sc. students and the post-graduate M.Sc. students, but are also being fully equipped for the research work of the teaching staff of the department and for the higher studies leading to the doctorate degrees of the Muslim University.

The main inorganic laboratory, illuminated by strong north light, equipped with six large fume cupboards and two balance rooms, is designed to meet the needs of more than a hundred pass degree students at a time. The main organic laboratory, similarly illuminated and equipped with fume cupboards, has its own balance room and combustion room and is being designed with a system of alternate lead-covered benches fitted with a steam line for the removal of inflammable solvents.

There are three lecture theatres, the largest of which is intended to seat 250 students at a time and will be used for the large first and second year classes in inorganic chemistry and for the special lectures that are given from time to time at Aligarh by visiting professors from other universities. Vacuum and steam lines are being designed for the main organic laboratory and for all the smaller research rooms of the staff and post-graduate students, and a central corridor fitted with special skylights will provide north light for all the smaller laboratories.

This building is intended to meet the needs of the present number of chemistry students at Aligarh (usually between 300 and 400) and to allow for the research work that is being undertaken by the staff and the post-graduate students. As Aligarh, however, is the university of the 70 million Mohammedans of India, due regard has been paid to the probable necessity for further expansion in the next ten years.

Imports of Alkali into Japan

THE imports during 1930 of soda ash and caustic soda into Kobe and Osaka were 31,705 and 26,259 short tons, respectively. The imports of the same commodities during 1929 were 42,181 and 35,288 short tons. Great Britain and East Africa were the largest sources of supply for soda ash ; in caustic soda Great Britain furnished 62 per cent. of the imports and United States 24 per cent. As there has been strong competition in the alkali field in Japan, negotiations were recently carried out whereby imports were limited by agreement.

Trade Publication

ELECTRIC FURNACES AND OVENS as applied to industry are illustrated and described in a new booklet issued by the General Electric Co., Ltd. (H.O. 5,884). Individual points dealt with are working costs, control, labour, atmosphere control and maintenance.

Soda Ash as Desulphurising Agent

Effects on Iron and Steel Products

As early as 1867 Horsley, of Derby, called attention to the effect of the addition of alkalis in removing sulphur from molten iron. Recent investigations of the Metallurgical Research Staff of Imperial Chemical Industries have now established conclusively that a 50–60 per cent. reduction in the sulphur content of the metal can be effected by the use of relatively small proportions of a cheap industrial chemical, soda ash.

The use of soda ash as a desulphurising agent successfully overcomes one of the most important problems of modern foundry practice, the control of sulphur impurity in cast iron. Low sulphur content in pig iron does not infer a low sulphur content in the finished castings unless high quality coke is used and only a limited proportion of scrap remelted in the course of production. The necessity of reducing the sulphur content to meet the requirements of the modern specification has, therefore, imposed restrictions on the foundry industry in the choice of raw materials and thereby increased the cost of manufacture. The problem is of special importance when the metal is required for conversion into steel by the Tropenas converter.

The process of desulphurising by means of soda ash is both simple and inexpensive. It can be applied at various stages in the manufacture of steel ingots, steel castings, refined pig iron and iron castings of different grades, *e.g.*, grey iron, white iron, malleable iron and iron alloys, and no important changes in the normal foundry routine are involved. The only reagents required are the ordinary commercial grades of soda ash in powder form, and ground limestone, and the cost is about 1s. 6d. per ton of metal. The reduction of the sulphur content of the metal prevents the cracking of steel castings. Moreover, it is accompanied by a definite improvement in the physical properties of the metal and by the almost complete elimination of non-metallic inclusions of sulphides, oxides, etc.—an effect of special importance in foundries producing castings that are to be submitted to a hydraulic test or exposed in use to the action of corrosive liquors. The cost of manufacture is reduced because products that would normally demand the use of high quality raw materials can be made by the use of pig iron and coke of higher sulphur content and a greater proportion of metal scrap.

The results of both laboratory investigations and trials under practical foundry conditions are given in a booklet on *The Desulphurisation of Cast Iron by Means of Soda Ash*, just issued by Imperial Chemical Industries, Ltd., London, who are prepared to give advice and technical assistance to firms interested in the process.

High Temperature Nickel Alloys

CAST alloys for high-temperature service were considered from the theoretical and the practical standpoints, in the course of a recent lecture delivered to the Institute of British Foundrymen, by D. Hanson. The author indicated the close inter-relationship of mechanical strength and chemical stability in relation to heat-resisting alloys, and discussed the fundamental high-temperature characteristics of a number of metals, and their inherent capacity for alloying. It was pointed out that it is iron and nickel among the common metals which possess outstandingly useful combinations of high melting point and mechanical strength, and that they therefore form the obvious basis materials for the development of high-temperature alloys ; nickel may be fairly regarded as the most important basic material for alloys of maximum strength at elevated temperatures. Alloys of this metal undoubtedly offer the engineer a wide range of useful material and their further development and modification promises the solution of a very large number of problems arising in high-temperature engineering. Factors determining the behaviour of materials at raised temperature were briefly summarised, and the range of heat-resisting alloys commercially available was reviewed, consideration being given to the properties and scope of application of iron-base alloys (*e.g.*, low-alloy nickel-chromium steels), cast iron (*e.g.*, "Nimol," containing nickel, copper and chromium), nickel-chromium alloys, with and without iron (*e.g.*, "Brightray," "Cronite," "Nichrome") and the high-alloy nickel-chromium steels.

From Week to Week

AN OUTBREAK OF FIRE which occurred last week at the Castle Mills works of the North British Rubber Co., Edinburgh, caused damage estimated at £15,000.

MR. R. E. GILMORE, superintendent of the Fuel Research Laboratories of the Department of Mines, Canada, has been elected chairman of the Ottawa Branch of the Society of Chemical Industry.

AT THE RECENT final examination held by the Chartered Institute of Patent Agents, Mr. Bertram Thomas King (younger son of Mr. B. T. King, managing director of Kings Patent Agency, Ltd., London) was successful.

IMPORTS OF CALCIUM CARBIDE into Belgium during 1930 were 9,843 metric tons, compared with 8,489 tons for 1929. During 1930 the imports of this product into France were 2,349 metric tons; Italy, 1,546; Poland, 1,498; and Germany, 1,349.

ACCORDING to statistics published in the annual report of the Federated Malay States Trade and Customs Department the largest quantity of nitrogenous fertilisers imported during 1930 came from the United Kingdom ($55,222), Germany coming second ($23,842).

IT IS INTENDED TO COMMEMORATE the life and work of the late Sir Charles Parsons by the formation of an Association that will be open to old employees of A. C. Parsons and Co., Ltd., and the Parsons Marine Steam Turbine Co., Ltd., as well as all members of these firms throughout the world.

FOLLOWING RESEARCH WORK conducted by the Indian Institute of Science, it is understood that the Bangalore White Lead Syndicate is now meeting one fifth of the Indian demand for white lead. A large proportion of this production is purchased by the Indian railways, but further expansion in the trade is expected to develop from other domestic consumers.

AS A RESULT of representations to the employers, the proposed wages cut on Perth dyeworkers is to be slightly modified. The original suggestion was that the reduction should be 6s. in the case of men, and 2s. in the case of women, but the employers have now agreed that the reduction should be 5s. for skilled dyers, 4s. for other men, and 1s. for women. The reduction is proposed on the grounds of a fall in the cost of living.

DR. FRANK T. SHUTT is retiring from his position as Dominion Chemist and Assistant Director of the Experimental Farms of the Department of Agriculture, Canada, after forty-four years in national and scientific service. Early in his work, Dr. Shutt was associated with agricultural research in both England and Germany. In 1888, visits were made to Rothamsted and many stations on the Continent, and his early associations with men like Sir John Bennett Lawes and Sir Joseph Henry Gilbert were reflected in the splendid leadership transferred to Canada.

ACCORDING to a recent report on the German chemical industry compiled by the United States Department of Commerce, this industry now comprises 3,000 plants with 320,000 employees. It is handicapped by the foreign competition developed since the war and by the dominating power of the I.G. Farbenindustrie, which is so active in almost all fields of chemistry that independent initiative is restricted. Meanwhile, about 13 per cent. of the world's production of chemicals is now manufactured in countries which had no chemical manufacture of importance in 1913. At that date the world production was about $2,500,000,000 in value. For 1927 it has been estimated at $5,250,000,000.

THE MEDICAL RESEARCH COUNCIL announce that they have appointed a Therapeutic Trials Committee, to advise and assist them in arranging for properly controlled clinical tests of new products that seem likely, on experimental grounds, to have value in the treatment of disease. Conditions have been the subject of discussion and agreement between the Medical Research Council and the Association of British Chemical Manufacturers, under which the Therapeutic Trial Committee will be prepared to consider applications by commercial firms for the examination of new products, submitted with the available experimental evidence of their value, and will arrange appropriate clinical trials in suitable cases.

RECENT WILLS include: Mr. G. E. M. Monckton-Arundell, of Doncaster, chairman of the New Monckton Coke and Chemical Co., who left unsettled estate of the value of £12,763, with net personalty £5,038.

A NEW COLOUR CARD has just been prepared by the British Colour Council forecasting fashionable shades for the spring of 1932. Cards are now available for the silk and woollen industries, while leather and hosiery cards will be issued probably next week.

A MEMORANDUM on the appointment of agents and the best methods to be adopted in trading with Portugal and Portuguese West Africa has been issued by the Department of Overseas Trade, 35, Old Queen Street, London, S.W.1, reference number C.X. 3,591.

WITH THE OBJECT OF ENCOURAGING home manufacture of the reagents required by scientific institutions and industrial laboratories, the Russian Industrial Chemistry Syndicate has made a grant of 250,000 roubles to the Gosmertorgprom trust for the extension of factories producing fine chemicals.

THE INDIAN GEOLOGICAL DEPARTMENT, it is reported, are making arrangements for an investigation into oil and thermal spring regions, where large quantities of gas escape into the air, in the hope that helium may be found, in the same way as it was discovered in America. The United States now hold a virtual monopoly of helium, though the gas has been found in Ceylon in small quantities.

IN THE ANNUAL REPORT of the University of Leeds it is stated that arrangements have been made by the Mining Department of the University with the Department of Scientific and Industrial Research for the establishment of a research station to undertake a physical and chemical survey of the West Yorkshire Coalfield. Mr. A. M. Wandless, of Cambridge, has been appointed officer in charge.

AT THE eighth annual conference of the Association of Special Libraries and Information Bureaux, to be held next month in Lady Margaret Hall, Oxford, Sir Frederic Nathan is down to present a paper on "International Abstracting and Indexing," a subject on which he addressed the Chemical Engineering Group some time ago. The president of the Association is Mr. H. T. Tizard and the chairman, Dr. R. S. Hutton.

IT IS ANNOUNCED that the two Sheffield firms, E. W. Oakes and Co., Rockingham Street, and William Turner and Co., Eyre Street, refiners of and dealers in precious metals, have amalgamated their businesses under the style of Oakes, Turner and Co., which in turn has become a subsidiary of Johnson, Matthey and Co., Hatton Garden, London, E.C. The plant at the Rockingham Street Works, engaged in the production of rolled, drawn and pierced wires, has been augmented by the purchase of the business of the late Mr. John Gorrill, Sidney Street, Sheffield.

IN A REPORT on economic and trade conditions in Latvia (July, 1931) prepared by H.M. Consul at Riga, and issued by the Department of Overseas Trade, it is stated that a considerable decrease has taken place in the output of rubber footwear, matches, and fertilisers, while the production of linoleum was suspended altogether. The imports of chemicals, minerals, oils, etc., amounted to 45,738,000 lats (25·235 lats to the £1). Most of the imports come from Germany, the United Kingdom coming third on the list with 25,078,000 lats, while the exports to the United Kingdom (70,325,000 lats) exceed those to any other country.

IN REFERRING TO the suggested plant at Billingham-on-Tees for the production of petrol from coal, the *North Mail* states that two schemes are being considered. The smaller provides for the erection of a plant to manufacture 213,000 tons of petrol a year. This is double the size of the plant that has already proved commercially successful in Germany. Direct and permanent employment for 5,000 men would result from the institution of this plant, the cost of which is estimated to be between £7,000,000 and £8,000,000. The more ambitious scheme calls for an annual output of 1,000,000 tons of petrol, which would necessitate the use of 4,000,000 tons of coal and give employment to 24,000 workers, of whom 13,000 would be miners. The capital cost is estimated to be £33,000,000 to £38,000,000. This would yield one-third of the total petrol requirements of the country.

Patent Literature

The following information is prepared from published Patent Specifications and from the Illustrated Official Journal (Patents) by permission of the Controller to H.M. Stationery Office. Printed copies of full Patent Specifications accepted may be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2, at 1s. each.

Abstracts of Accepted Specifications

347,666. SUBSTITUTED PHTHALIC ANHYDRIDES. P. F. Bangham, J. Thomas and Scottish Dyes, Ltd., Earl's Road, Grangemouth. Application date, September 24, 1929.

A salt of a halogen phthalic acid is heated with the theoretical amount of sulphuric or hydrochloric acid, preferably concentrated, to obtain a sulphate or chloride and the corresponding halogen phthalic anhydride. The product is suitable for use in condensations involving the use of anyhdrous aluminium chloride. In an example, the acid sodium salt of 4-chlor-phthalic acid is heated with 100 per cent. sulphuric acid to 200° C. for several hours. The 4-chlor-phthalic anhydride may be separated by extraction with benzene, toluene, or solvent naphtha.

347,681. DYES. Soc. of Chemical Industry in Basle, Switzerland. International Convention date, January 25, 1929.

Amino-dibenzanthrone is heated with tetrachlorquinone or 2:5-dichlorquinone in the presence of nitrobenzene and in the absence of catalysts and acid-binding agents. The product is a dyestuff containing chlorine and dyeing blue-green shades fast to chlorine. Reference is directed by the Comptroller to Specification No. 307,947.

347,722. DYES. J. Y. Johnson, London. From I.G. Farbenindustrie Akt.-Ges., Frankfort-on-Main, Germany. Application date, October 31, 1929.

Anthraquinone-β:α:(N)-benzacridone or derivatives other than iodo derivatives are treated with chlorine or bromine or agents supplying them in inorganic acid media such as sulphuric acid, oleum, chlor-sulphonic acid or metal chloride melts. Halogen transferers may be present, and also catalysts such as iron, iron chloride, mercury, antimony, iodine, and sulphur. The products dye red shades differing from those obtained with halogenated derivatives prepared in organic diluents. Examples are given of the chlorination of anthraquinone 2:1-benzacridone and derivatives such as Bz3-methyl-, Bz3:5-dimethyl-, Bz3-alkozy-, Bz3-chloro-, Bz5-chloro-, Bz2-chloro-, Bz4-chloro,- Bz3:5-dichloro-, 4-Bz3:5-trichloro-, 4-nitro-Bz3:5-dichloro-, Bz3- nitro-. The products derived from Bz3:5-dihalogen derivatives are of particular value. Particulars are also given of the preparation of the starting materials.

347,737. SYNTHETIC RESINS. Bakelite Corporation, 247, Park Avenue, New York, Assignees of V. H. Turkington, 75, Arlington Avenue, Caldwell, N.J., and W. H. Butler, 218, Laurel Avenue, Arlington, N.J., U.S.A. International Convention date, January 29, 1929.

Formaldehyde, acetaldehyde, hexamethylene-tetramine or furfural is heated with a hydroxy derivative of a polyaryl compound in which two aryl rings are directly united between a single carbon atom of each ring, *e.g.*, in the hydroxy-diphenyls. The products are synthetic resins.

347,742. DYES. Soc. of Chemical Industry in Basle, Switzerland. International Convention date, February 2, 1929.

A diazo compound which does not carry hydroxyl in *o* or *p*-position to the diazo group is coupled with a sulphonated or unsulphonated ether of 1:2-amino-naphthol, the product rediazotised and coupled (alkaline) with a 2:5:7-aminonaphthol sulphonic acid or an N-aryl derivative containing no external amino group. The products may be saponified and give violet blue to green-blue shades on cotton and regenerated cellulose fibres. The dyestuffs may be converted into metal compounds. Examples of these dyestuffs include aniline-2-sulphonic acid → 1-amino-2-methoxy-naphthalene-6-sulphonic acid → (alkaline) phenyl-2:5:7-acid, 2-amino-naphthalene-4:8-disulphonic acid → 1-amino-2-ethoxy-naphthalene → (in aqueous pyridine solution) 2:5:7-acid. A large number of other components are specified, and examples are also given of the copper compounds of these dyestuffs.

347,743. OXIDISING ORGANIC COMPOUNDS. J. Y. Johnson, London. From I.G. Farbenindustrie Akt.-Ges., Frankfort-on-Main, Germany. Application date, January 31, 1930.

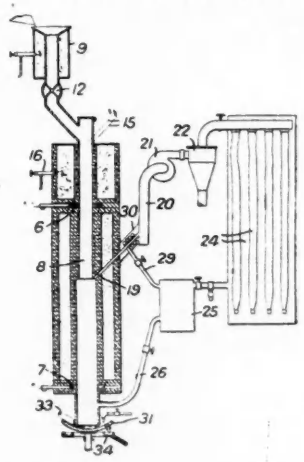
Aromatic compounds containing methyl or methylene groups, are heated with selenious or selenic acid so that the methyl and methylene groups attached to ring systems which are sensitive to the usual oxidising agents, are oxidised to aldehyde, carboxyl, or ketonic groups without the ring system being affected. Examples are given of the oxidation of 2:methylbenzanthrone to benzanthrone-2-aldehyde, 6-methyl-benzanthrone to benzanthrone-6-aldehyde, in each case with aqueous selenious acid. If selenic acid in glacial acetic acid, or selenious acid in nitrobenzene is used, 2-methyl-benzanthrone yields benzanthrone-2-carboxylic acid. Other oxidations include 2-benzyl-benzanthrone to 2-benzoyl-benzanthrone, 5-methyl-naphthanthraquinone to naphthanthraquinone-5-carboxylic acid, or 5-aldehyde according to the conditions, and 1:5-dibenzoyl-2:6-dimethyl-naphthalene to 1:5-dibenzoyl-naphthalene-2:6-dicarboxylic acid.

347,774. DYE INTERMEDIATES. A Carpmael, London. From I.G. Farbenindustrie Akt.-Ges., Frankfort-on-Main, Germany. Application date, February 7, 1930.

To obtain monoacyl-diamines of the benzene series derived from 1:3- or 1:4-diaminobenzene in which the other positions may be occupied by hydrogen, halogen, alkyl, or alkoxyl radicles, the corresponding nitrophenyl amides of aromatic sulphonic acids are reduced with iron, acylated with an aromatic or aromatic-aliphatic carboxylic acid halide, and treated with concentrated sulphuric acid to hydrolyse off the aryl sulphonic group. In an example, 5-nitro-4-methyl-2-benzene sulphamido-1-methoxy-benzene is reduced, the mixture made alkaline with caustic soda, and the amino compound recovered. Benzoyl or other similar chloride is added, and the benzoyl compound filtered off and hydrolysed with sulphuric acid to obtain 5-benzoyl-amino-4-methyl-2-amino-1-methoxy-benzene sulphate, from which the free base is obtained. Examples are also given of the treatment of 5-nitro-4-methyl-2-benzene-sulphamido-1-ethoxybenzene, 5-nitro-4-methyl-2-benzene-sulphamino-phenylbutylether, 5-nitro-2-benzene-sulphamino-1:4-hydroquinone-dimethylether, and several others. The preparation of some of these starting materials is also described.

347,799. ZINC SULPHIDE. W. W. Triggs, London. From St. Joseph Lead Co., 250, Park Avenue, New York. Application date, February 24, 1930.

Raw zinc sulphide is heated at 1,000° C. with exclusion of air, and the vapour conveyed in nitrogen and superheated



347,799

steam to a cooler. A mixture of crude ore with anthracite is passed through a preheater 9 to a second preheater 16 to an electric furnace 8. A gate valve 12 is controlled by the level of the material in relation to the electrodes, 15 so that the gate is opened when contact is broken. The temperature in the preheater 16 is approximately that between the elec-

trodes 7. The vaporised zinc sulphide passes through passage 19 over a coil 30 to a condensing chamber 20, and thence through blower 21 to separator 22 and collecting bags 24. The inert gas from generator 25 is circulated through the furnace by pipe 26, and also through pipes 29, 30. The solid residue is removed from the rotating bowl 31 at the base of the furnace. The crystalline zinc sulphide is suitable for use as a pigment.

347,802. SYNTHETIC RUBBER. J. Y. Johnson, London. From I.G. Farbenindustrie Akt.-Ges., Frankfort-on-Main, Germany. Application date, February 28, 1930.

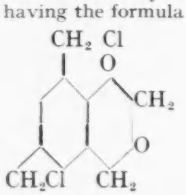
Diolefines or homologues or analogues are polymerised by alkali or alkaline earth metals in the presence of saturated or unsaturated organic halogen compounds such as ethylene chloride or bromide, 1 : 2-propylene chloride, vinyl chloride or bromide, etc., in the presence of solvents or diluents and/or cyclic diethers, unsaturated ethers or acetals as described in Specifications No. 334,184 and 340,008 (see THE CHEMICAL AGE, Vol. XXIII, p. 412, and Vol. XXIV, p. 195). Several examples are given.

347,849. ZINC OXIDE AND CARBONATE. J. Y. Johnson, London. From I.G. Farbenindustrie Akt.-Ges., Frankfort-on-Main, Germany. Application date, April 5, 1930.

In the production of sodium hydrosulphite and the sodium salt of formaldehyde sulphinic acid, a grey-black zinc oxide or carbonate is formed. This may be bleached either in aqueous *suspension or in thin layers* at a red heat by means of air, oxygen, peroxides, alkali or alkaline earth hypochlorites. The bleached product is employed in rubber vulcanisation.

347,887 and 347,892. HALOGEN METHYL COMPOUNDS. W. W. Groves, London. From I.G. Farbenindustrie Akt.-Ges., Frankfort-on-Main, Germany. Application date, May 3, 1930.

347,887. An aqueous formaldehyde solution is saturated with gaseous hydrogen halide and is treated with phenol or a homologue. If the addition is made rapidly at a moderate temperature, resinous mixtures of chlormethyl compounds are obtained, but if phenol is added slowly at a low temperature a crystalline compound having the formula

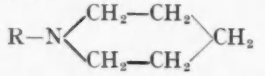


is obtained. Examples are given of the preparation of chlormethyl derivatives from phenol, *p*-cresol, and a technical cresol mixture. The products are intermediates for the preparation of dyestuffs, synthetic resins, tanning materials, etc. When treated with phenols, hydrogen halide is eliminated, yielding resins, and when treated with secondary bases, basic substances are obtained.

347,892. A benzene derivative which contains at least one alkoxy or alkylthio group and either no further substituent or an alkyl, halogen or nitro group, is treated with formaldehyde in the presence of a concentrated hydrogen halide solution. Either one or two halogen-methyl groups enter the molecule according to the conditions. Examples are given of the treatment of anisol to obtain 2 : 4-di (chlormethyl) anisol, *p*-cresol-methyl ether to obtain 3-chlor-methyl-4-methoxy-toluene, *o*-nitro-anisol to obtain a monochlor-methyl derivative, *p*-thiocresol-methyl ether to obtain a monochlor-methyl derivative, and others.

347,916. PRESERVING OILS. Goodyear Tire and Rubber Co., 1144, East Market Street, Akron, Ohio, U.S.A. Assignees of A. M. Clifford, 1649, Honodle Street, Akron, Ohio, U.S.A. International Convention date, July 27, 1929.

Unsaturated hydrocarbons, transformer oils, etc., are preserved from oxidation by adding a condensation product of a naphthol and piperidine, having the structure



in which R is a naphthyl group. In an example, mixture of α-naphthol and piperidine is subjected to heat and pressure in an autoclave, yielding a viscous oil which is washed with acid and alkali, and distilled.

347,931-3. CATALYTIC PRODUCTION OF KETONES. Rheinische Kamfer Fabrik Ges. Oberkassel, and H. Sandkuhl, Büderich, both in Düsseldorf, Germany. Application dates June 14 and June 4, 1930.

337,931. Secondary alcohols are steam-distilled and the mixed vapour passed over the catalyst at a temperature below the boiling point of the alcohol to obtain ketones. The process is applied to isopropyl alcohol, menthol, borneol, and cyclohexanol.

347,933. This is an addition to Specification No. 347,931 above, and that process is extended to the production of camphor from isoborneol, and acetophenone from methyl phenyl carbinol.

347,935. POTASSIUM NITRATE, SODA AND AMMONIUM CHLORIDE. Chemieverfahren Ges., 15, Bochum, Germany. International Convention date, July 13, 1929.

Gypsum is treated with mother liquor of an ammonia-soda process containing ammonium carbonate and bicarbonate. Calcium carbonate is precipitated and separated, and the liquor containing ammonium sulphate is treated with sylvinite and ammonia to precipitate 3 K_2SO_4. Na_2SO_4 and potassium chloride. This is separated and treated with water to form potassium sulphate and a solution of sodium chloride which is returned to the process. The liquor containing sodium and *ammonium chlorides is cooled, precipitating part of the* ammonium chloride, and subjected to the Solvay process to form soda. The mother liquor is then used for treating more gypsum. The calcium carbonate and potassium sulphate from the first step are treated with nitric acid to form gypsum for use again, and potassium nitrate which is crystallised. The liquor is used to dissolve the potassium sulphate obtained in an earlier stage.

347,937. PHOSPHORUS AND PHOSPHORIC ACID. Metallges Akt.-Ges., 45, Bockenheimer Aulage, Frankfort-on-Main, Germany. International Convention date, June 11, 1929.

Phosphates in the form of previously sintered pieces are treated in a shaft furnace with coke and silica or silicates. The sintering is effected by heating the phosphate with 6-10 per cent. of coke dust in a Dwight-Lloyd apparatus, and while still hot the phosphate is treated with a mixture of coke dust and water which may contain molasses residues to promote adhesion. The product should be porous. The shaft furnace is charged with alternate layers of phosphate and coke, the lower walls are water-cooled, and the blast is pre-heated to 700-800° C.

347,974. FERTILISERS. Imperial Chemical Industries, Ltd., Millbank, London. International Convention date, July 20, 1929.

Normal, double or triple superphosphate is treated with gaseous, aqueous or anhydrous ammonia in two or more stages *e.g.*, aqueous ammonia for one stage and liquid ammonia for the next stage. The product has a minimum amount of reverted phosphate. The process may be worked in batches or continuously.

Specifications Accepted with Date of Application

353,411. Metalliferous dyestuffs, Manufacture of. Soc. of Chemical Industry in Basle. March 16, 1929.

353,413. Aldols, Manufacture of. T. H. Durrans and F. W. Lewis. March 21, 1930.

353,422. Vat Dyes, Manufacture of. Imperial Chemical Industries, Ltd., A. G. Perkin, A. Shepherdson, and N. H. Haddock. April 17, 1930.

353,467. Aliphatic ketones, Manufacture of. British Celanese, Ltd., H. F. Oxley, W. H. Groombridge, and E. B. Thomas. April 16, 1930.

353,455. Acetaldehyde from methane and carbon dioxide, Production of. Gutehoffnungshutte Oberhausen Akt.-Ges. April 29, 1929.

353,475. Sulphonic acids of the aliphatic series, Preparation of. H. T. Bohme Akt.-Ges. May 3, 1929.

353,477. Iodomethane suplhonic acid and homologues thereof, and salts of these compounds, Manufacture of. A. Carpmael. (*I.G. Farbenindustrie Akt.-Ges.*) April 24, 1930.

353,506. Carbonaceous materials, Treatment of—with hydrogen in the presence of catalysts. H. D. Elkington. (*Naamlooze Vennootschap de Bataafsche Petroleum Maatschappij.*) April 25, 1930.

353,537. Acridine derivatives, Manufacture of. A. Carpmael. (*I.G. Farbenindustrie Akt.-Ges.*) April 30, 1930.

353,538. Water-insoluble azo-dyestuffs, Manufacture of. A. Carpmael. (*I.G. Farbenindustrie Akt.-Ges.*) April 30, 1930.
353,539. Bismuth salts, Manufacture of. A. Carpmael. (*I.G. Farbenindustrie Akt.-Ges.*) April 30, 1930.
353,577. Thiazole compounds. Manufacture of. Imperial Chemical Industries, Ltd. May 18, 1929.
353,578. Aryl-sulphonic esters of 2:8-dihydroxy-naphthalene-6-sulphonic acid, Manufacture of. A. Carpmael. (*I.G. Farbenindustrie Akt.-Ges.*) May 16, 1930.
353,580. Vulcanization accelerators. Imperial Chemical Industries, Ltd., H. M. Bunbury, W. J. S. Naunton, and W. A. Sexton. May 17, 1930.
353,616. Derivatives of resin acids, Production of. Chemische Fabriken Dr. K. Albert Ges. August 28, 1929.
353,622. Carrying out catalytic gas reactions. J. Y. Johnson. (*I.G. Farbenindustrie Akt.-Ges.*) June 6, 1930.
353,688. Acetic anhydride, Manufacture of. I.G. Farbenindustrie Akt.-Ges. August 1, 1929.
353,692. Vulcanized rubber and the like, Manufacture of. Imperial Chemical Industries, Ltd. (*E. I. Du Pont de Nemours and Co.*) July 24, 1930.
353,733. Sodium nitrate, Manufacture of. A. Mentzel. August 31, 1929. Addition to 9,689/30.
353,736. Oxidation products of derivatives of higher fatty acids containing sulphur. A. Carpmael. (*I.G. Farbenindustrie Akt.-Ges.*) August 25, 1930. Addition to 340,012.
353,749. Simultaneous production of phosphorus, or phosphoric acid, and alumina. I.G. Farbenindustrie Akt.-Ges. September 4, 1929.
353,763. Fertilizers. Odda Smelteverk Aktieselskapet and E. Johnson. September 28, 1929.
353,792. Catalytic hydrogenation of hydrocarbon oils. Standard Oil Development Co. October 17, 1929.
353,815. Metallic tungsten, Production of. I.G. Farbenindustrie Akt.-Ges. December 31, 1929.

Applications for Patents

[In the case of applications for patents under the International Convention, the priority date (that is, the original application date abroad which the applicant desires shall be accorded to the patent) is given in brackets, with the name of the country of origin. Specifications of such applications are open to inspection at the Patent Office on the anniversary of the date given in brackets, whether or not they have been accepted.]

Alcock, H. E. Manufacture of hydrogen peroxide. 21,519. July 28.
Aluminium-Industrie Akt.-Ges. Electrolytic production of aluminium. 21,937. July 31. (Germany, July 31, 1930.)
Berl, E., and Stevens, A. H. Production of acetic anhydride. 22,149. August 5.
—— Production of threads, etc., from cellulose derivatives. 22,227. August 5.
—— Production of threads, etc., from cellulose acetates. 22,228. August 5.
—— Production of acetic anhydride from acetic acid. 22,229. August 5.
—— Production of highly-acetylated cellulose acetates. 22,274. August 6.
Brandt, R. Apparatus for electrolytic revivification of ferrocyanide of potassium. 21,629. July 29. (Germany, December 8, 1930.)
Campbell, J. M., and Prater, T. H. Disposal of ammonia by conversion into a combustible gas. 21,988. August 1.
Caro, N., and Frank, A. R. Manufacture of lime nitrogen. 22,312. August 6. (Germany, August 8, 1930.)
Carpmael, A. (I.G. Farbenindustrie Akt.-Ges.). Manufacture and technical application of products from unsaturated fatty acids etc. 21,952. July 31.
—— Manufacture of vulcanisation products resembling rubber. 22,143, 22,144. August 4.
Carughi, A., Paoloni, C., and Soc. Elettrica ed Elettrochimica del Caffaro. Manufacture of chloride of lime. 22,200. August 5. (Italy, March 25.)
Chemische Fabrik vorm. Sandoz. Preparation of wetting-agents. 21,692. July 29. (Germany, July 30, 1930.)
—— Process for manufacture of sulphurized derivatives of phenols. 21,946. July 31. (Germany, August 2, 1930.)
Chemische und Siefenfabrik R. Baumheier Akt.-Ges. Impregnating fabrics with soaps. 22,321. August 6. (Germany, August 6, 1930.)
—— Emulsifying-agents. 22,322. August 6. (Germany, August 6, 1930.)
—— Production of sulpho acids. 22,323. August 6. (Germany, August 6, 1930.)
—— Production of sulphonated oils and fats. 22,324. August 6. (Germany, August 6, 1930.)
Coley, H. E. Production of volatile metals. 21,545. July 28.
Daranyi, S. C. Fermentation of carbohydrates. 21,593. July 28.
—— Manufacture of yeast. 21,594. July 28.
Davies, G. P., and Imperial Chemical Industries, Ltd. Purification of aromatic nitro-compounds. 21,421. July 27.
Dayton Synthetic Chemicals, Inc. Manufacture of synthetic resins, etc. 21,810. July 30.
Du Pont Ammonia Corporation. Decomposing ammonia. 21,927. July 31. (United States, August 1, 1930.)
Geigy Akt.-Ges., J. R. Manufacture of dyestuffs. 21,568. July 28. (Germany, July 28, 1930.)
Goodyear Tire and Rubber Co. Compounding rubber. 21,824. July 30. (United States, November 25, 1930.)
—— Process for making 2-chlorbenzothiazole. 21,825. July 30. (United States, November 19, 1930.)
—— Manufacture of reaction products of hydroxy diphenyl, etc. 21,826. July 30. (United States, December 18, 1930.)
Greenstreet, C. J. Manufacture of fatty acids and soaps therefrom. 21,949. July 31.
Greiner, H. Manufacture of pyridine derivatives. 21,454. July 27.
Groves, W. W. (I.G. Farbenindustrie Akt.-Ges.). Manufacture of 6-bromo-2-hydroxy-3-naphthoic acid. 21,439. July 27.
Gutehoffnungschütte Oberhausen Akt.-Ges. Process for producing acetaldehyde from acetylene. 22,013. August 1. (Germany, August 2, 1930.)
I.G. Farbenindustrie Akt.-Ges and Johnson, J. Y. Manufacture of derivatives of polymerised aromatic compounds. 21,389. July 27. (November 13, 1930.)
—— Manufacture of 6-bromo-2-hydroxy-3-naphthoic acid. 21,439. July 27.
—— Manufacture of white mineral colours. 22,202. August 5.
—— Recovery of lubricating-oils. 22,247. August 6.
I.G. Farbenindustrie Akt.-Ges. Production of anhydrous fused caustic soda. 21,392. July 27. Germany, November 4, 1930.)
—— Production of welded structural members. 22,101. August 4. (Germany, October 4, 1930.)
—— Manufacture of nitro-β-hydroxy-pyridine and nitro-β-hydroxy-alkyl-pyridines. 22,129. August 4. (Germany, August 2, 1930.)
—— Agents for coating, lining, and cementing. 22,130. August 4. (Germany, August 2, 1930.)
—— Manufacture of indigoid vat dyestuffs. 22,147. August 4. (Germany, August 1, 1930.)
—— Light-sensitive photographic material. 22,391. August 7. (Germany, August 8, 1930.)
Imperial Chemical Industries, Ltd. Reducing inflammability of rubber preparations. 21,422. July 27.
—— Agents for diminishing foaming and frothing. 21,636. July 29.
—— Production of arylmercapto compounds. 21,924. July 31.
—— Manufacture of mercaptoarylamines. 21,925. July 31.
—— Sulphonated higher alcohols. 21,926. July 31.
Johnson, J. Y. Manufacture of fertilisers. 21,653. July 29.
—— Apparatus for continuous distillation of tars, mineral oils, etc. 21,654. July 29.
—— Apparatus for manufacture of liquid hydrocarbons. 21,655. July 29.
—— Manufacture of azo dyestuffs. 21,656. July 29.
Koenigs, E. Manufacture of pyridine derivatives. 21,454. July 27.
Leicestershire (L. and N.) Coal Distillation, Ltd., and Machen, C. Cleansing carbonaceous matter. 22,424. August 7.
Lonza Elektrizitätswerke und Chemische Fabriken Akt.-Ges. Manufacture of formic acid from formates. 22,392. August 7. (Switzerland, August 10, 1930.)
—— Preparation of mixed manures containing ammonium nitrate. 22,408. August 7. (Switzerland, August 10, 1930.)
McKesson and Robbins, Inc. Normal heptyl phenol, and process for production thereof. 21,657. July 29.
Möller, E. Manufacture and separation of sulphur-containing splitting-products of the acid hydrolysis of keratin, etc. 21,675. July 29.
Mond Nickel Co., Ltd. Alloys. 21,939. July 31.
Palmer, K. W. Production of arylmercapto compounds. 21,924. July 31.
—— Manufacture of mercaptoarylamines. 21,925. July 31.
Podbielniak, W. J. Apparatus for analytical distillation. 22,415. August 7. (United States, August 15, 1930.)
Standard-I. G. Co. Manufacture of oxidation products of paraffin. 22,501. August 8. (United States, August 14, 1930.)
Standard Oil Co. Separating wax from oil. 22,292. August 6. (United States, August 7, 1930.)
Sturm, E. Manufacture and separation of sulphur-containing splitting-products of the acid hydrolysis of keratin, etc. 21,675. July 29.
Verity, C. H. Carbonisation, etc., of hydro-carbons. 21,886. July 31.
Ward, D. Sulphonated higher alcohols. 21,926. July 31.
White, A. E. (Dayton Synthetic Chemicals, Inc.). Manufacture of synthetic resins, etc. 21,810. July 30.
Woodward, J. B. Apparatus for mixing and emulsifying chemicals, paints, etc. 21,670. July 29.
Wülfing, J. A. [Firm of], R. von. Manufacture and separation of sulphur-containing splitting-products of the acid hydrolysis of keratin, etc. 21,675. July 29.

Weekly Prices of British Chemical Products

The prices and comments given below respecting British chemical products are based on direct information supplied by the British manufacturers concerned. Unless otherwise qualified, the figures quoted apply to fair quantities, net and naked at makers' works.

General Heavy Chemicals

ACID ACETIC, 40% TECH.—£17 15s. per ton d/d address U.K. in casks.
ACID CHROMIC.—11d. per lb., less 2½% d/d U.K.
ACID HYDROCHLORIC.—Spot, 3s. 9d. to 6s. carboy d/d, according to purity, strength and locality.
ACID NITRIC, 80° Tw.—Spot, £20 to £25 per ton makers' works, according to district and quality.
ACID SULPHURIC.—Average National prices f.o.r. makers' works, with slight variations up and down owing to local considerations; 140° Tw., Crude acid, 60s. per ton. 168° Tw., Arsenical, £5 10s. per ton. 168° Tw., Non-arsenical, £6 15s. per ton.
AMMONIA (ANHYDROUS).—Spot, 10d. per lb., d/d in cylinders.
AMMONIUM BICHROMATE.—8½d. per lb. d/d U.K., or 8d. c.i.f. export
BISULPHITE OF LIME.—£7 10s. per ton, f.o.r. London, packages free.
BLEACHING POWDER, 35/37%.—Spot, £7 19s. per ton d/d station in casks, special terms for contracts.
BORAX, COMMERCIAL.—Crystals, £13 10s. per ton; granulated, £12 10s. per ton; powder, £14 per ton. (Packed in 1 cwt. bags. carriage paid any station in Great Britain. Prices quoted are for one ton lots and upwards.)
CALCIUM CHLORIDE (SOLID), 70/75%.—Spot, £4 15s. to £5 5s. per ton d/d station in drums.
CHROMIUM OXIDE.—9d. to 9½d. per lb. according to quantity d/d U.K.
CHROMETAN.—Crystals, 3½d. per lb. Liquor, £18 12s. 6d. per ton d/d U.K.
COPPER SULPHATE.—£25 to £25 10s. per ton.
METHYLATED SPIRIT 61 O.P.—Industrial, 1s. 11d. to 2s. 4d. per gall.; pyridinised industrial, 2s. 1d. to 2s. 6d. per gall.; mineralised, 3s. to 3s. 4d. per gall. 64 O.P., 1d. extra in all cases. Prices according to quantity.
NICKEL SULPHATE.—£38 per ton d/d.
NICKEL AMMONIA SULPHATE.—£38 per ton d/d.
POTASH CAUSTIC.—£30 to £33 per ton.
POTASSIUM BICHROMATE CRYSTALS AND GRANULAR.—4½d. per lb. nett d/d U.K., discount according to quantity: ground ½d. per lb. extra.
POTASSIUM CHLORATE.—3½d. per lb. ex-wharf, London, in cwt. kegs.
POTASSIUM CHROMATE.—8½d. per lb. d/d U.K., or 8d. c.i.f. export.
SALAMMONIAC.—Firsts lump, spot, £40 17s. 6d. per ton d/d address in barrels. Chloride of ammonia, £37 to £45 per ton, carr. paid.
SALT CAKE, UNGROUND.—Spot, £3 10s. per ton d/d station in bulk.
SODA ASH, 58%.—Spot, £6 per ton, f.o.r. in bags, special terms for contracts.
SODA CAUSTIC, SOLID, 76/77°E.—Spot, £14 10s. per ton, d/d station.
SODA CRYSTALS.—Spot, £5 to £5 5s. per ton, d/d station or ex depot in 2-cwt. bags.
SODIUM ACETATE 97/98%.—£21 per ton.
SODIUM BICARBONATE, REFINED.—Spot, £10 10s. per ton d/d station in bags.
SODIUM BICHROMATE CRYSTALS (CAKE AND POWDER)—3½d. per lb. nett d/d U.K., discount according to quantity. Anhydrous ½d. per lb. extra.
SODIUM BISULPHITE POWDER, 60/62%.—£16 10s. per ton delivered 1-cwt. iron drums for home trade.
SODIUM CHLORATE.—2½d. per lb.
SODIUM CHROMATE.—3½d. per lb. d/d U.K., or 3½d. c.i.f. export.
SODIUM NITRITE.—Spot, £19 per ton, d/d station in drums.
SODIUM PHOSPHATE.—£14 per ton, f.o.r. London, casks free.
SODIUM SILICATE, 140° Tw.—Spot, £8 5s. per ton, d/d station returnable drums.
SODIUM SULPHATE (GLAUBER SALTS).—Spot, £4 2s. 6d. per ton, d/d.
SODIUM SULPHIDE SOLID, 60/62%.—Spot, £10 5s. per ton, d/d in drums. Crystals—Spot, £8 5s. per ton, d/d in casks.
SODIUM SULPHITE, PEA CRYSTALS.—Spot, £13 10s. per ton, d/d station in kegs. Commercial—Spot, £9 per ton, d/d station in bags.

Coal Tar Products

ACID CARBOLIC CRYSTALS.—4½d. to 6½d. per lb. Crude 60's 1s. to 1s. 1d. per gall. August/December.
ACID CRESYLIC 99/100.—1s. 9d. to 1s. 10d. per gall. B.P., 3s. 6d. per gall. 97/99.—Refined, 2s. 2d. to 2s. 3d. per gall. Pale, 98%, 1s. 7d. to 1s. 8d. Dark, 1s. 4d. to 1s. 4½d.
ANTHRACENE OIL, STRAINED (GREEN OIL).—4½d. to 4½d. per gall.
BENZOLE.—Prices at works: Crude, 5½d. to 6½d. per gall.; Standard Motor, 1s. to 1s. 1d. per gall. 90%.—1s. 1d. to 1s. 2d. per gall. Pure, 1s. 4d. to 1s 5d. per gall.
TOLUOLE.—90%, 1s. 8d. to 1s. 9d. per gall. Pure, 1s. 10d. to 1s. 11d. per gall.
XYLOL.—1s. 7d. to 1s 8d. per gall. Pure, 1s. 10d to 1s. 11d. per gall.
CREOSOTE.—Standard specification, for export, 5dd. to 5½d. net per gall. f.o.b.; for Home, 3½d. per gall. d/d.
NAPHTHA.—Solvent, 90/160, 1s. 3d. per gall. Solvent, 95/160, 1s. 4d. to 1s. 5d. per gall. Solvent, 90/190, 1s. to 1s. 2d. per gall.
NAPHTHALENE.—Purified Crystals, £10 per ton.
PITCH.—Medium soft, 52s. 6d. per ton, in bulk at makers' works.
PYRIDINE.—90/140, 3s. to 3s. 3d. per gall. 90/160, 3s. 3d. to 3s. 6d. per gall. 90/180, 1s. 9d. to 2s. per gall.

Intermediates and Dyes

In the following list of Intermediates delivered prices include packages except where otherwise stated:—

ACID GAMMA.—Spot, 3s 3d. per lb. 100% d/d buyer's works.
ACID H.—Spot, 2s. 3d. per lb. 100% d/d buyer's works.
ACID NAPHTHIONIC.—1s. 2d. per lb. 100% d/d buyer's works.
ACID NEVILLE AND WINTHER.—Spot, 2s. 6d. per lb. 100% d/d buyer's works.
ACID SULPHANILIC.—Spot, 8½d. per lb. 100% d/d buyer's works.
ANILINE OIL.—Spot, 8d. per lb., drums extra, d/d buyer's works.
ANILINE SALTS.—Spot, 8d. per lb. d/d buyer's works, casks free.
BENZALDEHYDE.—Spot, 1s. 6d. per lb., packages extra, d/d buyer's works.
BENZIDINE BASE.—Spot, 2s. 3d. per lb. 100% d/d buyer's works.
o-CRESOL 30/31° C.—£2 6s. 5d. per cwt., in 1-ton lots.
m-CRESOL 98/100%.—2s. 9d. per lb., in ton lots.
p-CRESOL 34·5° C.—1s. 9d. per lb., in ton lots.
DICHLORANILINE.—2s. 5d. per lb.
DIMETHYLANILINE.—Spot, 1s. 6d. per lb., packages extra, d/d buyer's works.
DINITROBENZENE.—7½d. per lb.
DINITROTOLUENE.—48/50° C., 7d. per lb.; 66/68° C., 7½d. per lb.
DIPHENYLAMINE.—Spot, 1s. 8d. per lb. d/d buyer s works.
a-NAPHTHOL.—Spot, 1s. 9d. per lb. d/d buyer's works.
B-NAPHTHOL.—Spot, £65 per ton in 1 ton lots, d/d buyer's works.
a-NAPHTHYLAMINE.—Spot, 10½d. per lb. d/d buyer's works.
B-NAPHTHYLAMINE.—Spot, 2s. 9d. per lb. d/d buyer's works.
o-NITRANILINE.—5s. 11d. per lb.
m-NITRANILINE.—Spot, 2s. 6d. per lb. d/d buyer's works.
p-NITRANILINE.—Spot, 1s. 8d. per lb. d/d buyer's works.
NITROBENZENE.—Spot, 6½d. per lb., 5-cwt. lots, drums extra, d/d buyer's works.
NITRONAPHTHALENE.—8½d. per lb.
SODIUM NAPHTHIONATE.—Spot, 1s. 6d. per lb. 100% d/d buyer's works.
o-TOLUIDINE.—Spot, 9½d. per lb., drums extra, d/d buyer's works.
p-TOLUIDINE.—Spot, 1s. 6d. per lb. d/d buyer's works.
m-XYLIDINE ACETATE.—3s. 3d. per lb., 100%.

Wood Distillation Products

ACETATE OF LIME.—Brown, £7 5s. to £7 10s. per ton. Grey, £12 per ton. Liquor, 9d. per gall.
ACETONE.—£63 to £65 per ton.
CHARCOAL.—£6 to £8 10s. per ton, according to grade and locality.
IRON LIQUOR.—24°/30° Tw., 10d. to 1s. 2d. per gall.
RED LIQUOR.—16° Tw., 8½d. to 10d. per gall.
WOOD CREOSOTE.—1s. 9d. per gall., unrefined.
WOOD NAPHTHA, MISCIBLE.—2s. 9d. to 2s. 11s. per gall., according to quantity. Solvent, 3s. 9d. per gall.
WOOD TAR.—£4 to £5 per ton.
BROWN SUGAR OF LEAD.—£32 per ton.

Rubber Chemicals

ANTIMONY SULPHIDE.—Golden, 6d. to 1s. 1d. per lb. according to quality; Crimson, 1s. 3d. to 1s. 5d. per lb., according to quality.
ARSENIC SULPHIDE, YELLOW.—1s. 5d. to 1s. 7d. per lb.
BARYTES.—£6 to £7 10s. per ton, according to quality.
CADMIUM SULPHIDE.—4s. 6d. to 5s. per lb.
CARBON BISULPHIDE.—£26 to £28 per ton, according to quantity; drums extra.
CARBON BLACK.—3d. to 4d. per lb., ex wharf.
CARBON TETRACHLORIDE.—£40 to £50 per ton, according to quantity drums extra.
CHROMIUM OXIDE, GREEN.—1s. 2d. per lb.
DIPHENYLGUANIDINE.—2s. 6d. per lb.
INDIARUBBER SUBSTITUTES, WHITE.—4½d. to 5½d. per lb.; DARK, 4½d. to 4½d. per lb.
LAMP BLACK.—£28 per ton, barrels free.
LITHOPONE, 30%.—£18 to £20 per ton.
SULPHUR.—£9 10s. to £13 per ton, according to quality.
SULPHUR CHLORIDE.—4d. to 7d. per lb., carboys extra.
SULPHUR PRECIP. B.P.—£55 to £60 per ton, according to quantity.
VERMILION, PALE OR DEEP.—6s. 4d. to 6s. 10d. per lb.
ZINC SULPHIDE.—8d. to 11d. per lb.

Pharmaceutical and Photographic Chemicals

ACETANILIDE.—1s. 4d. to 1s. 6d. per lb.

ACID, ACETIC, PURE, 80%.—£35 5s. per ton d/d address U.K. in casks.

ACID, ACETYL SALICYLIC.—2s. 7d. to 2s. 9d. per lb., according to quantity.

ACID, BENZOIC B.P.—1s. 10d. per lb., for synthetic product. Solely ex Gum, 1s. 3d. to 1s. 6d. per oz.; 50-oz. lots, 1s. 3d. per oz.

ACID, BORIC B.P.—Crystal, £31 per ton; powder, £32 per ton; For one-ton lots and upwards. Packed in 1-cwt. bags carriage paid any station in Great Britain.

ACID, CAMPHORIC.—19s. to 21s. per lb.

ACID, CITRIC.—10¾d. per lb., less 5%.

ACID, GALLIC.—2s. 11d. per lb. for pure crystal, in cwt. lots.

ACID, MOLYBDIC.—5s. 3d. per lb. in ½-cwt. lots. Packages extra. Special prices for quantities and contracts.

ACID, PYROGALLIC, CRYSTALS.—7s. 3d. per lb. for 28-lb. lots; Resublimed, 8s. 6d. per lb. for 28-lb. lots, d/d.

ACID, SALICYLIC, B.P. PULV.—1s. 5d. to 1s. 8d. per lb. Technical.—1s. to 1s. 2d. per lb.

ACID, TANNIC B.P.—2s. 8d. to 2s. 10d. per lb.

ACID, TARTARIC.—10¾d. per lb., less 5%.

AMIDOL.—7s. 6d. to 11s. 3d. per lb., according to quantity.

AMMONIUM BENZOATE.—3s. 6d. per lb.

AMMONIUM CARBONATE B.P.—£36 per ton. Powder, £39 per ton in 5-cwt. casks. Resublimated, 1s. per lb.

AMMONIUM MOLYBDATE.—4s. 9d. per lb. in ½-cwt. lots. Packages extra. Special prices for quantities and contracts.

ATROPHINE SULPHATE.—7s. to 7s. 6d. per oz., according to quantity.

BARBITONE.—5s. 9d. to 6s. per lb.

BENZONAPHTHOL.—2s. 10d. per lb.

BISMUTH CARBONATE.—7s. 9d. per lb.

BISMUTH CITRATE.—8s. 7d. per lb.

BISMUTH SALICYLATE.—7s. 11d. per lb.

BISMUTH SUBNITRATE.—6s. 9d. per lb.

BISMUTH NITRATE.—Cryst. 5s. 6d. per lb.

BISMUTH OXIDE.—10s. 9d. per lb.

BISMUTH SUBCHLORIDE.—10s. 5d. per lb.

BISMUTH SUBGALLATE.—7s. 9d. per lb. Extra and reduced prices for smaller and larger quantities of all bismuth salts respectively.

BISMUTHI ET AMMON LIQUOR.—Cit. B.P. in W. Qts. 1s. 0½d. per lb.; 12 W. Qts. 11½d. per lb.; 36 W. Qts. 11d. per lb. Liquor Bismuth B.P., in W. Qts., 1s. 2½d. per lb.; 6 W. Qts., 1s. per lb.; 12 W. Qts., 10½d. per lb.; 36 W. Qts., 10d. per lb.

BORAX B.P.—Crystal, £21 10s. per ton; powder, £22 per ton; for one-ton lots and upwards. Packed in 1-cwt. bags carriage paid any station in Great Britain.

BROMIDES.—Ammonium, 1s. 9d. per lb.; potassium, 1s. 4½d. per lb.; granular, 1s. 5d. per lb.; sodium, 1s. 7d. per lb. Prices for 1-cwt. lots.

CAFFEIN, PURE.—6s. 6d. per lb.

CAFFEIN CITRAS.—5s. per lb.

CALCIUM LACTATE.—B.P., 1s. 1½d. to 1s. 3d. per lb., according to quantity.

CAMPHOR.—Refined flowers, 2s. 8d. to 2s. 10d. per lb., according to quantity; also special contract prices.

CHLORAL HYDRATE.—2s. 11½d. to 3s. 1½d. per lb.

CHLOROFORM.—2s. 4d. per lb.

ETHERS.—S.G. ·730—1s. 1d. to 1s. 2d. per lb., according to quantity; other gravities at proportionate prices.

FORMALDEHYDE, 40%.—30s. per cwt., in barrels, ex wharf.

GLUCOSE, MEDICINAL.—1s. 6d. to 2s. per lb. for large quantities.

HEXAMINE.—1s. 10d. to 2s. per lb., according to quantity.

HYDROGEN PEROXIDE (12 VOLS.).—1s. 4d. per gallon, f.o.r. makers' works, naked. B.P., 10 vols., 2s. to 2s. 3d. per gall.; 20 vols., 3s. per gall.

HYDROQUINONE.—4s. 7d. per lb. in 1-lb. lots; 3s. 5¾d. per lb. in cwt. lots.

HYPOPHOSPHITES.—Calcium, 2s. 11d. to 3s. 4d. per lb.; potassium, 3s. 2d. to 3s. 7d. per lb.; sodium, 3s. 1d. to 3s. 6d. per lb.; for 28-lb. lots.

IRON AMMONIUM CITRATE.—B.P., 1s. 9d. per lb., for 28-lb. lots. Green, 2s. 6d. per lb., list price. U.S.P., 2s. 7d. per lb. list price.

IRON PERCHLORIDE.—18s. to 20s. per cwt., according to quantity.

IRON QUININE CITRATE.—B.P., 8¼d. to 8¾d. per oz.

MAGNESIUM CARBONATE.—Light B.P., 36s. per cwt.

MAGNESIUM OXIDE.—Light Commercial, £62 10s. per ton, less 2½%; Heavy commercial, £21 per ton, less 2½%; in quantity lower; Heavy Pure, 2s. to 2s. 3d. per lb.

MENTHOL.—A.B.R. recrystallised B.P., 14s. per lb. net; Synthetic, 8s. 6d. to 12s. per lb.; Synthetic detached crystals, 8s. 6d. to 9s. 9d. per lb., according to quantity; Liquid (95%), 8s. per lb.

MERCURIALS B.P.—Up to 1-cwt. lots, Red Oxide, crystals, 7s. 4d. to 7s. 5d. per lb., levig., 6s. 11d. to 7s. per lb.; Corrosive Sublimate, Lump, 5s. 10d. to 5s. 11d. per lb., Powder, 5s. 3d. to 5s. 4d. per lb.; White Precipitate, Lump, 5s. 10d. to 5s. 11d. per lb., Powder, 5s. 11d. to 6s. per lb.; Calomel, 6s. 3d. to 6s. 4d. per lb.; Yellow Oxide, 6s. 9d. to 6s. 10d. per lb.; Persulph, B.P.C., 6s. 1d. to 6s. 2d. per lb.; Sulph. nig., 6s. 5d. to 6s. 6d. per lb. Special prices for larger quantities.

METHYL SALICYLATE.—1s. 3d. to 1s. 4d. per lb.

PARAFORMALDEHYDE.—1s. 6d. per lb.

PARALDEHYDE.—1s. 1d. per lb.

PHENACETIN.—3s. 9d. to 4s. 1d. per lb.

PHENOLPHTHALEIN.—5s. to 5s. 2½d. per lb.

POTASSIUM BITARTRATE 99/100% (Cream of Tartar).—78s. per cwt., less 2½ per cent.

POTASSIUM CITRATE.—B.P., 1s. 7d. per lb. for 28-lb. lots.

POTASSIUM FERRICYANIDE.—1s. 7½d. per lb., in 125-lb. kegs.

POTASSIUM IODIDE.—16s. 8d. to 17s. 9d. per lb., as to quantity.

POTASSIUM METABISULPHITE.—50s. per cwt. d/dLondon, kegs free.

POTASSIUM PERMANGANATE.—B.P. crystals, 5½d. per lb., spot.

QUININE SULPHATE.—1s. 8d. per oz. for 1,000-oz. lots.

SACCHARIN.—43s. 6d. per lb.

SALICIN.—16s. 6d. to 17s. 6d. per lb., according to quantity.

SILVER NITRATE.—10d. per oz. for 500-oz. lots, sticks, 2d. per oz. extra.

SODIUM BARBITONUM.—8s. 6d. to 9s. per lb. for 1-cwt. lots.

SODIUM BENZOATE B.P.—1s. 6d. to 1s. 7½d. per lb.

SODIUM CITRATE.—B.P.C. 1911, 1s. 4d. per lb. B.P.C. 1923, and U.S.P., 1s. 8d. per lb. for 28-lb. lots.

SODIUM HYPOSULPHITE, PHOTOGRAPHIC.—£15 per ton, d/d consignee's station in 1-cwt. kegs.

SODIUM NITROPRUSSIDE.—16s. per lb.

SODIUM POTASSIUM TARTRATE (ROCHELLE SALT).—75s. per cwt. net, ton lots, d/s of 5 cwt. Crystals, 2s. 6d. per cwt. extra.

SODIUM SALICYLATE.—Powder, 1s. 10d. to 2s. 2d. per lb. Crystal, 1s. 11d. to 2s. 3d. per lb.

SODIUM SULPHIDE, PURE RECRYSTALLISED.—10d. to 1s. 2d. per lb.

SODIUM SULPHITE, ANHYDROUS.—£26 to £28 per ton, according to quantity. Delivered U.K.

STRYCHNINE, ALKALOID CRYSTAL, 2s. per oz.; hydrochloride, 1s. 9½d. per oz.; nitrate, 1s. 8d. per oz.; sulphate, 1s. 9d. per oz., for 1,000-oz. quantities.

TARTAR EMETIC, B.P.—Crystal or powder, 1s. 9d. to 2s. per lb.

THYMOL.—Puriss, 6s. 1½d. to 7s. per lb., according to quantity. Natural, 12s. per lb.

ZINC STEARATE.—1s. 4d. to 1s. 6d. per lb.

Perfumery Chemicals

ACETOPHENONE.—7s. per lb.

AUBEPINE (EX ANETHOL).—8s. 9d. per lb.

AMYL ACETATE.—2s. 3d. per lb.

AMYL BUTYRATE.—4s. 9d. per lb.

AMYL CINNAMIC ALDEHYDE.—8s. 6d. per lb.

AMYL SALICYLATE.—2s. 6d. per lb.

ANETHOL (M.P. 21/22° C.).—5s. per lb.

BENZALDEHYDE FREE FROM CHLORINE.—2s. 6d. per lb.

BENZYL ACETATE FROM CHLORINE-FREE ALCOHOL.—1s. 3d. per lb.

BENZYL ALCOHOL FREE FROM CHLORINE.—1s. 9d. per lb.

BENZYL BENZOATE.—2s. 2d. per lb.

CINNAMIC ALDEHYDE NATURAL.—11s. 9d. per lb.

COUMARIN.—12s. per lb.

CITRONELLOL.—7s. 3d. per lb.

CITRAL.—6s. per lb.

ETHYL CINNAMATE.—6s. 9d. per lb.

ETHYL PHTHALATE.—2s. 6d. per lb.

EUGENOL.—7s. 6d. per lb.

GERANIOL.—6s. to 10s. per lb.

GERANIOL (FROM PALMAROSA).—14s. per lb.

HELIOTROPINE.—5s. 6d. per lb.

ISO EUGENOL.—9s. per lb.

LINALOL (EX BOIS DE ROSE).—5s. 6d. per lb.

LINALYL ACETATE, EX BOIS DE ROSE.—7s. 6d. per lb. Ex Shui Oil, 7s. 6d. per lb.

METHYL ANTHRANILATE.—6s. per lb.

METHYL BENZOATE.—4s. 3d. per lb.

MUSK XYLOL.—6s. 6d. per lb.

PHENYL ETHYL ACETATE.—10s. per lb.

PHENYL ETHYL ALCOHOL.—8s. 3d. per lb.

RHODINOL.—40s. per lb.

SAFROL—1s. 6d. per lb.

VANILLIN, EX CLOVE OIL.—14s. 6d. to 16s. 6d. per lb. Ex Guaiacol.—13s. to 15s. per lb.

Essential Oils

ANISE OIL.—2s. 6d. per lb.

BERGAMOT OIL.—8s. 6d. per lb.

BOURBON GERANIUM OIL.—17s. 6d. per lb.

CAMPHOR OIL.—White, 100s. per cwt.; Brown, 100s. per cwt.

CANANGA.—Java, 7s. per lb.

CINNAMON OIL LEAF.—4s. per oz.

CITRONELLA OIL.—Java, 2s. 6d. per lb., c.i.f. Pure Ceylon, 2s. per lb.

CLOVE OIL, 90/92%.—6s. per lb.

EUCALYPTUS OIL, AUSTRALIAN, B.P. 70/75%—1s. 4d. per lb.

LAVENDER OIL.—Mont Blanc, 38/40%, 9s. per lb.

LEMON OIL.—4s. 3d. per lb.

LEMONGRASS OIL.—2s. 9d. per lb.

ORANGE, SWEET.—8s. per lb.

OTTO OF ROSE.—Anatolian, 40s. per oz.; Bulgarian, 60s. per oz.

PALMA ROSA.—8s. 9d. per lb.

PETITGRAIN.—5s. 9d. per lb.

SANDALWOOD.—Mysore, 28s. 6d. per lb.

London Chemical Market

The following notes on the London Chemical Market are specially supplied to* THE CHEMICAL AGE *by Messrs. R. W. Greeff & Co., Ltd., and Messrs. Chas. Page & Co., Ltd., and may be accepted as representing these firms' independent and impartial opinions.

London, August 13, 1931.

A FAIR volume of business has been transacted during the current week with the markets remaining practically unchanged.

General Chemicals

ACETONE.—Quoted at £60 to £63 per ton, according to quantity, with a fairly good demand for small quantities.

ACID, ACETIC.—Steady at £34 5s. to £36 5s. per ton for technical 80% and £35 5s. to £37 5s. for pure 80%, and in fairly good request.

ACID, CITRIC is unchanged and slow of sale at about 11½d. per lb., less 5%.

ACID, FORMIC.—Quoted at £37 per ton, with a fair demand.

ACID, LACTIC.—In steady request at about £38 per ton for 50% by weight quality.

ACID, OXALIC.—The market continues strong at £34 per ton in casks and £35 per ton in 1 cwt. kegs, carriage paid, with a brisk demand.

ACID, TARTARIC.—Unchanged at about 10½d. per lb., less 5%, with the demand for small quantities only.

ALUMINA SULPHATE.—Unchanged at £7 5s. to £8 5s. per ton for the 17/18% iron free quality, and a steady trade is being done.

ARSENIC.—Supplies of Cornish material are still scarce for early delivery, with the market nominal at about £20 per ton. Imported material continues to be offered at about £19 to £19 10s. per ton.

CREAM OF TARTAR.—Steady at about £78 to £79 per ton, ex store London, and in quiet request.

COPPER SULPHATE.—A little more business has been put through, with the market fairly steady at about £19 per ton.

FORMALDEHYDE.—The market is steady at about £28 per ton, at which figure there is a fair amount of business moving.

LEAD ACETATE.—In fair demand at £31 15s. per ton for white and £30 15s. per ton for brown.

LITHOPONE.—Unchanged at £18 to £22 per ton, according to grade and quantity, with a steady call.

POTASSIUM BICHROMATE.—Firm at 4¼d. per lb., with usual discounts for contracts.

POTASSIUM CHLORATE.—Steady at £28 to £32 per ton, with the demand fairly active.

PERMANGANATE OF POTASH.—The market is maintained at 5¼d. to 5½d. per lb., ex warehouse London, for needle crystals B.P., and in everyday request.

SODA BICHROMATE.—The market is firm at 3½d. per lb., with usual discount for contracts.

SODA HYPOSULPHITE.—Photographic crystals in good demand at about £14 5s. per ton, with commercial crystals steady at £8 10s. per ton.

SODIUM PRUSSIATE.—Unchanged and in fairly good request at 4½d. to 5¼d. per lb., according to quantity.

TARTAR EMETIC.—In fair demand at about 10½d. per lb.

ZINC SULPHATE.—Unchanged at £10 10s. per ton, at which figure the market is receiving a fair demand.

Coal Tar Products

THE market for coal tar products is unchanged from last week, and prices remain the same.

MOTOR BENZOL is quoted at about 1s. 4½d. to 1s. 5½d. per gal., f.o.r.

SOLVENT NAPHTHA is unchanged at about 1s. 1½d. to 1s. 2d. per gallon, f.o.r.

HEAVY NAPHTHA remains at about 11d. to 1s. 0½d. per gallon, f.o.r.

CREOSOTE OIL is quoted at about 3d. to 3½d. per gallon, f.o.r., in the North, and at about 4d. to 4½d. per gallon in London.

CRESYLIC ACID is worth about 1s. 8d. per gallon for the 98/100% quality, and about 1s. 6d. per gallon for the dark quality 95/97%.

NAPHTHALENES are quoted at about £3 10s. to £3 15s. per ton for the firelighter quality, at about £4 to £4 5s. per ton for the 74/76 quality, and at about £5 per ton for the 76/78 quality.

PITCH is unchanged at 45s. to 47s. 6d. per ton, f.o.b. East Coast port, for forward delivery.

THE following additional prices have been supplied to us :—

Carbolic Acid.—Prices are unchanged; 5 tons are still quoted at 5½d. with druggists quantities at 6¼d. per lb. in bulk packing.

Sodium Salicylate.—Unchanged at 1s. 10½d. for powder and 1s. 11½d. for crystal, in 1-ton lots.

Salicylic Acid.—Crystal and powder is quoted at 1s. 5d. per lb. in ton quantities, 5 cwt. lots at 1s. 6d., 1 cwt. at 1s. 6½d.

Saccharin.—Unchanged at 43s. 6d. per lb. net, duty paid, delivered.

Aspirin.—2s. 7d. to 2s. 9d. per lb.

Phenolphthalein.—A steady market 5s. per lb. for 10 cwt., 5s. 1d. for 2 cwt., and any smaller quantities 5s. 2½d. per lb.

Nitrogen Fertilisers

Sulphate of Ammonia.—Export.—The present price of sulphate of ammonia is £5 15s. per ton, f.o.b. U.K. ports in new single bags. We understand that some small sellers have made sales at slightly under this price. *Home.*—We understand that the home price has been reduced to £6 from £6 10s., but apart from fertiliser manufacturers there is very little interest in this product.

Nitrate of Soda.—It has been reported that sales for the present month are being made at £8 17s. per ton, but the price scale for the new season has not yet been announced.

Latest Oil Prices

LONDON, August 12.—LINSEED OIL was steady at 10s. to 12s. 6d. decline. Spot, ex mill, £17 5s.; August., £14 12s. 6d.; September-December, £15 2s. 6d.; January-April, £16 naked. RAPE OIL was slow. Crude extracted, £26; technical refined, £27 10s., naked, ex wharf. COTTON OIL was steady. Egyptian crude, £18; refined common edible, £21; deodorised, £23, naked, ex mill. TURPENTINE was quiet. American, spot, 47s.; September-December, 35s. per cwt.

HULL.—LINSEED OIL.—Spot to December, closed at £15 10s. naked; January-April at £16. COTTON OIL.—Egyptian, crude, spot, £18 10s.; edible, refined, spot, £20 15s.; technical, spot, £20 15s.; deodorised, £22 15s. PALM KERNEL OIL, crude, f.m.q., spot, £19 10s. naked. GROUNDNUT OIL, crushed/extracted, spot, £24 10s.; deodorized, £28 10s. SOYA OIL, crushed/extracted, spot, £17; deodorized, £20 10s. RAPE OIL, crushed/extracted, spot £25 10s.; refined, £27 10s. per ton. COD OIL, 17s. per cwt. CASTOR OIL, pharmacy, spot, 40s. 6d.; firsts, 35s. 6d.; seconds, 33s. 6d. per cwt. TURPENTINE, American, spot, 49s. 6d. per cwt.

South Wales By-Products

THERE is scarcely any change in South Wales by-product activities. Business generally is slow and sporadic and the immediate prospects are not bright. The call for pitch continues to be small and is almost confined to prompt parcels. There is no change in values and stocks are in excess of demands. Road tar has a steady, if moderate, call round about 13s. per 40-gallon barrel. Refined tars are fairly bright, there being a good demand for both gasworks and coke-oven tar. There is no change in quotations. Naphthas are quiet, there being only a small call for solvent and scarcely any demand for heavy. Creosote is weak, but motor benzol is in good request. Patent fuel and coke exports continue to be slow, but, with the autumn season at hand, it is expected that an improvement will set in during the next few weeks. Patent fuel prices, for export, are as follows :—19s. 9d. to 20s., ex-ship Cardiff; 19s. to 19s. 6d., ex-ship Swansea. Coke prices are :—Best foundry, 32s. 6d. to 36s. 6d.; good foundry, 22s. 6d. to 25s.; furnace, 16s. 6d. to 17s. 6d.

Scottish Coal Tar Products

CONDITIONS remain unsatisfactory in this area. Few new contracts are being placed, although deliveries of refined tar and creosote oil ex old contracts are proceeding rapidly. Stocks of other products are increasing gradually.

Cresylic Acid.—Market is stagnant with exception of high coefficient grades. Pale, 99/100%, 1s. 5d. to 1s. 6d. per gallon; pale, 97/99%, 1s. 3d. to 1s. 4d. per gallon; dark, 97/99%, 1s. 2d. to 1s. 3d. per gallon, f.o.r. naked. High boiling remains steady at 2s. to 2s. 6d. per gallon according to grade.

Carbolic Sixties.—Value is purely nominal at 1s. 1d. to 1s. 3d. per gallon according to quality.

Creosote Oil.—Deliveries are well forward and the demand for best grades is maintained. Specification oils, 2¼d. to 3d. per gallon; washed oil, 3¼d. to 3½d. per gallon; gasworks ordinary, 3½d. to 3¾d. per gallon; all ex makers' works.

Coal Tar Pitch.—The improved conditions reported in the South have not yet become effective here. Production is at a minimum and value is 40s. to 42s. 6d. per ton, f.a.s. Glasgow for export, and 37s. 6d. to 40s. per ton, f.o.r. works for home trade.

Blast Furnace Pitch.—Remains in moderate request at 30s. per ton, f.o.r. works for home trade, and 35s. per ton, f.a.s. Glasgow for export.

Refined Coal Tar.—Large quantities are leaving the various works, but new business is scarce. Quotations are steady at 2¼d. to 2¾d. per gallon, f.o.r. makers' works, naked.

Blast Furnace Tar.—Dull at 2¾d. per gallon, f.o.r.

Crude Naphtha.—Remarkably scarce, with value steady at 4¼d. to 5¼d. per gallon according to quality.

Water White Products.—Show no signs of improving, and stocks are accumulating. Motor benzole is 1s. 3d. to 1s. 4d. per gallon; 90/160 solvent, 1s. 2d. to 1s. 3d. per gallon; and 90/190 heavy solvent, 1s. to 1s. 1d. per gallon; all ex works.

Scottish Chemical Market

The following notes on the Scottish Chemical Market are specially supplied to THE CHEMICAL AGE *by Messrs. Charles Tennant and Co., Ltd., Glasgow, and may be accepted as representing this firm's independent and impartial opinions.*

Glasgow, August 11, 1931.

THERE is a slight improvement in business in the Scottish heavy chemical market.

Industrial Chemicals

ACETONE.—B.G.S.—£60 to £63 per ton, ex wharf, according to quantity.

ACID, ACETIC.—Prices ruling are as follows: glacial, 98/100%, £45 to £56 per ton; pure, £35 5s. per ton; technical, 80%, £34 5s., delivered in minimum lots of 1 ton.

ACID, BORIC.—Granulated commercial, £22 per ton; crystals, £23 per ton; B.P. crystals, £31 per ton; B.P. powder, £32 per ton, in 1-cwt. bags, delivered Great Britain free in one-ton lots upwards.

ACID, HYDROCHLORIC.—Usual steady demand. Arsenical quality, 4s. per carboy. Dearsenicated quality, 5s. per carboy, ex works, full wagon loads.

ACID, NITRIC, 80° QUALITY.—£23 per ton, ex station, full truck loads.

ACID, OXALIC.—98/100%.—On offer at 3¼d. per lb., ex store. On offer from the Continent at 3¼d. per lb., ex wharf.

ACID, SULPHURIC.—£3 7s. 6d. per ton, ex works, for 144° quality, £5 15s. per ton for 168°. Dearsenicated quality, 20s. per ton extra.

ACID, TARTARIC, B.P. CRYSTALS.—Quoted 1s. per lb., less 5%, ex wharf. On offer for prompt delivery from the Continent at 11¾d. per lb., less 5%, ex wharf.

ALUMINA SULPHATE.—Quoted round about £8 10s. per ton, ex store.

ALUM, LUMP POTASH.—Now quoted £8 10s. per ton., c.i.f. U.K. ports. Crystal meal, about 2s. 6d. per ton less.

AMMONIA ANHYDROUS.—Quoted 10½d. per lb., containers extra and returnable.

AMMONIA CARBONATE.—Lump quality quoted £36 per ton. Powdered, £38 per ton, packed in 5 cwt. casks, delivered U.K. stations or f.o.b. U.K. ports.

AMMONIA LIQUID, 80°.—Unchanged at about 2½d. to 3d. per lb., delivered, according to quantity.

AMMONIA MURIATE.—Grey galvanisers' crystals of British manufacture quoted £21 to £22 per ton, ex station. Fine white crystals offered from the Continent at about £17 5s. per ton, c.i.f. U.K. ports.

ANTIMONY OXIDE.—Spot material obtainable at round about £26 per ton, ex wharf. On offer for shipment from China at about £23 per ton, c.i.f. U.K.

ARSENIC, WHITE POWDERED.—Quoted £23 10s. per ton, ex wharf Spot material still on offer at £24 per ton, ex store.

BARIUM CHLORIDE.—In good demand and price about £9 10s. per ton, c.i.f. U.K. ports. For Continental materials our price would be £8 10s. per ton, f.o.b. Antwerp or Rotterdam.

BLEACHING POWDER.—British manufacturers' contract price to consumers unchanged at £6 15s. per ton, delivered in minimum 4-ton lots. Continental now offered at about the same figure.

CALCIUM CHLORIDE.—Remains unchanged. British manufacturers' price, £4 15s. to £5 5s. per ton, according to quantity and point of delivery. Continental material on offer at £4 7s. 6d. per ton, c.i.f. U.K. ports.

COPPERAS, GREEN.—At about £3 15s. per ton, f.o.r. works, or £4 12s. 6d. per ton, f.o.b. U.K. ports.

FORMALDEHYDE, 40%.—Now quoted £29 per ton, ex store. Continental on offer at about £27 per ton, ex wharf.

GLAUBER SALTS.—English material quoted £4 10s. per ton, ex station. Continental on offer at about £3 per ton, ex wharf.

LEAD, RED.—Price now £30 per ton, delivered buyers' works.

LEAD, WHITE.—Quoted £38 per ton, carriage paid.

LEAD ACETATE.—White crystals quoted round about £32 to £34 per ton c.i.f. U.K. ports. Brown on offer at about £1 per ton less.

MAGNESITE, GROUND CALCINED.—Quoted £9 10s. per ton, ex store.

METHYLATED SPIRIT.—Industrial quality 64 o.p. quoted 2s. per gallon, less 2½% delivered.

POTASSIUM BICHROMATE.—Quoted 4¼d. per lb., delivered U.K. or c.i.f. Irish ports, with an allowance for contracts.

POTASSIUM CARBONATE.—Spot material on offer, £24 10s. per ton ex store. Offered from the Continent at £23 10s. per ton, c.i.f. U.K. ports.

POTASSIUM CHLORATE, 99¾/100% POWDER.—Quoted £26 15s. per ton ex store; crystals 30s. per ton extra.

POTASSIUM NITRATE.—Refined granulated quality quoted £20 17s. 6d. per ton, c.i.f. U.K. ports. Spot material on offer at about £20 10s. per ton ex store.

POTASSIUM PERMANGANATE B.P. CRYSTALS.—Quoted 5¼d. per lb., ex wharf.

POTASSIUM PRUSSIATE (YELLOW).—Spot material quoted 7d. per lb. ex store. Offered for prompt delivery from the Continent at about 6¾d. per lb. ex wharf

SODA, CAUSTIC.—Powdered 98/99%, £17 10s. per ton in drums, £18 15s. in casks. Solid 76/77% £14 10s. per ton in drums, £14 12s. 6d. per ton for 70/72% in drums; all carriage paid buyer's station, minimum four-ton lots; for contracts 10s. per ton less.

SODIUM BICARBONATE.—Refined recrystallised, £10 10s. per ton, ex quay or station. M.W. quality 30s. per ton less.

SODIUM BICHROMATE.—Quoted 3¾d. per lb., delivered buyer's premises, with concession for contracts.

SODIUM CARBONATE (SODA CRYSTALS).—£5 to £5 5s. per ton, ex quay or station; powdered or pea quality, 7s. 6d. per ton extra. Light soda ash, £7 13s. per ton, ex quay, minimum four-ton lots, with various reductions for contracts.

SODIUM HYPOSULPHITE.—Large crystals of English manufacture quoted £9 2s. 6d. per ton, ex station. minimum four-ton lots. Pea crystals on offer at £15 per ton, ex station, minimum four-ton lots.

SODIUM NITRATE.—Chilean producers now offer at £10 per ton, carriage paid, buyer's sidings, minimum six-ton lots.

SODIUM PRUSSIATE.—Quoted 5¼d. per lb., ex store. On offer at 5d. per lb., ex wharf, to come forward.

SODIUM SULPHATE (SALTCAKE).—Price, 60s. per ton, ex works; 65s. per ton, delivered, for unground quality. Ground quality 2s. 6d. per ton extra.

SODIUM SULPHIDE.—Prices for home consumption: solid 61/62%, £10 per ton; broken, 60/62%, £11 per ton; crystals 30/32%, £8 2s. 6d. per ton, delivered buyers' works on contract, minimum four-ton lots. Special prices for some consumers. Spot material 5s. per ton extra.

SULPHUR.—Flowers, £12 per ton; roll, £10 10s. per ton; rock, £9 5s. per ton; ground American, £8 10s. per ton, ex store.

ZINC CHLORIDE 98%.—British material now offered at round about £18 10s. per ton, f.o.b. U.K. ports.

ZINC SULPHATE.—Quoted £11 per ton, ex wharf.

NOTE.—The above prices are for bulk business and are not to be taken as applicable to small parcels.

A New Use for Sugar

AFTER more than nine years' research work two American investigators have recently succeeded in perfecting a new plastic product with important properties by polymerising sugar. Its discoverers, Mr. Arthur S. Ford, a chemical engineer, and Mr. Benjamin Grey, a technical consultant, both of New York, have succeeded in producing a new substance in the various forms of a hard insoluble-glasslike mass, transparent wrapping material, synthetic rubber, and cellulose.

Messrs. Ford and Grey state that sugar, when polymerised by their new method, assumes a hard and glassy consistency, while a variation of the process will produce a water-white transparent "rubber." By a slight alteration of treatment, a cellulose film, whiter and more brilliant than celluloid, and non-inflammable, is produced. The production of clothing from this spun sugar polymerised by the new process is predicted by the discoverers, who state that boots and shoes with uppers of "sugar leather" and heels of "sugar plastic" are within sight of commercial production on a large scale. The substance can be made for about 4½d. per lb., and, should the price of rubber soar again, Messrs. Ford and Grey are confident that their discovery would prove an effective synthetic substitute. Its cost, moreover, is only a fraction of that of the artificial rubber developed by the German Dye Trust some time ago.

Irish Natural Products

CARRAGEEN, or "Irish Moss" as it is sometimes called, has now been placed on the market for household purposes in the Irish Free State and is being retailed at 7½d. per ¼-lb. packet by grocers. Considerable prominence is being given to the product by newspaper advertising and stress is being laid on its iodine, calcium and potash content. Recipes for the domestic uses of Carrageen are being distributed and up to the present sales are reported to have been satisfactory. This is the second natural chemical product that the Free State Government have brought into prominence and had placed on the market in commercial quantities, the first being kelp for the manufacture of iodine.

Manchester Chemical Market

[From Our Own Correspondent.]

Manchester, August 13, 1931.

The Manchester chemical market continues to be seriously affected by holiday slackness, although business this week has been a little more animated than it was last. An uncertain factor, however, in an already harassed cotton textile situation, is the serious slump during the last few days in the price of the raw material. There is some speculation as to the ultimate effect of this. In some quarters it is held that it may prove beneficial in the long run, but opinion on this point is not unanimous ; in any event, it has been too severe to be pleasant, and the chemical trade locally may suffer in company with others which more or less depend upon the textile industry.

Heavy Chemicals

Only a quiet demand has been reported in respect of sulphide of sodium, but offers in this section keep up at about £8 per ton for the commercial product and £9 for the 60–65 per cent. concentrated quality. Bicarbonate of soda has been firm in the neighbourhood of £10 10s. per ton, and a moderate business has been put through. Hyposulphite of soda has met with a quiet demand and values are about unchanged on balance at from £15 per ton for the photographic grade and £9 5s. for the commercial. Caustic soda is well held on a contract basis of £12 15s. to £14 per ton, according to quality. Only a slow inquiry has been reported during the past week in the case of chlorate of soda, and at about £26 per ton values are not too strong. Bichromate of soda is fairly steady and in moderate request at 3¾d. per lb., less 1 to 2½ per cent., according to quantity. Sales of phosphate of soda have been limited to small parcels but at £10 10s. per ton for the dibasic material there has been little further change in the price position. Alkali is steady and in fair demand at £6 per ton. There has been no quotable change in prussiate of soda, offers of which range from 4¾d. to 5¼d. per lb., according to quantity. Saltcake continues to be quoted here at round £3 per ton.

Carbonate of potash is quoted to-day at about £24 10s. per ton, with the demand on quiet lines. Permanganate of potash is slow, but at about 5d. per lb. for the commercial quality and from 5¼d. to 5½d. per lb. for the B.P. grade values have been about maintained. Caustic potash is in moderate request with quotations at from £27 to £27 10s. per ton. Yellow prussiate of potash keeps up at the old rates of 6¾d. to 7¼d. per lb., according to quantity, but no big weight of business is being done at the moment. Chlorate of potash is quiet but unchanged on balance at £27 15s. per ton. Bichromate of potash is selling in moderate quantities on the basis of 4¼d. per lb., less 1 to 2½d. per cent. discount.

The demand for sulphate of copper is on quiet lines, with offers ranging this week at from £18 to £18 10s. per ton, f.o.b. Arsenic continues firm on comparative scarcity at round £20 per ton, at the mines, for white powdered Cornish makes. The lead products are easy, and business is largely a matter of prompt parcels ; nitrate is quoted at £28 10s. per ton, with white acetate at about £32 and brown at £31. The acetates of lime are in limited inquiry, but no further weakness has developed, grey being at round £12 per ton and brown at £7 10s.

Acids and Tar Products

Citric acid is inactive, and the tendency seems still to be easy, with offers at about 11d. per lb. Tartaric acid is readily obtainable at 10½d. per lb., and sales are of limited extent. Acetic acid is unchanged at the recent reductions, the 80 per cent. commercial product being quoted at £35 per ton, and the technical glacial at £49. Oxalic acid is in moderate demand, and values are firm at £1 14s. 6d. per cwt., ex store.

Firmness is still in evidence in the case of pitch, with values at up to 47s. 6d. per ton, f.o.b. Solvent naphtha is very quiet indeed, and prices are easy at about 1s. 1d. per gallon, naked. Creosote oil is quoted at from 3d. to 4¼d. per gallon, naked, and the demand is slow. Crude carbolic acid continues firm at up to 1s. 4d. per gallon, naked, for 60's material ; crystal sales are quiet at a top figure of 5¼d. per lb., f.o.b.

Company News

Cyprus Asbestos Co.—The report for the year 1930 states that after adding the profit for the year of £245, and transferring £10,000 to stock depreciation reserve, there remains £29,072 to the credit of profit and loss account, which the directors propose to carry forward.

Timothy Whites (1928), Ltd.—It is announced that at the last annual meeting it was decided that the company's financial year should end on September 30 yearly, and not on July 31 as in the past. The accounts for the current year will, therefore, be made up to September 30, 1931, and shareholders will receive the same towards the end of the year.

Grape Produce, Ltd.—At the annual meeting on Monday, presided over by Mr. F. W. Parsons, a conditional agreement providing for the sale to Vine Products, Ltd., of the stocks, raw materials, plant, machinery, and equipment, the freehold and leasehold premises and the goodwill of the business of the company for the sum of £13,400 was approved. The solicitor to the company said it was thought that the holders of the participating preferred ordinary shares would receive from 2s. to 2s. 6d. for each 5s. share ; it had not been possible to suggest any arrangement under which the deferred shareholders would receive any distribution.

British Tintex and Dye Products, Ltd.—At the general meeting held on August 6, the chairman, Mr. Robert Johnston, said that a change in the selling agency of the business in Australia was made in December last, and for the five months since that date, small, but progressive profits had been earned. With regard to the British company, an agreement had been entered into with J. C. Eno, Ltd., who took over the selling end of the business for the home market from March last. Since then, there had been a considerable increase in turnover and economies had been effected. It was clear that if the sales could be extended to the figures which were attained in the early months of 1930, a definite profit would be earned. Replying to questions, Mr. Johnston said that with regard to the subject of reconstruction the company's solicitors and auditors considered that no useful purpose could be served at the moment by incurring reconstruction expenses. It was obvious, however, that sooner or later something drastic would have to be done.

Increased Consumption of Cement

The construction of concrete roads in India is being increasingly appreciated, though some misapprehension still exists among engineers regarding their durability and cost. The first concrete roads were constructed in Benares Cantonment and on the Grand Trunk Road between Benares and Moghul Sarai in 1927, and they are reported to be wearing well after four years of heavy traffic of all sorts, including steel-tyred bullock carts. Since then, the State of Hyderabad has constructed similar roads in Hyderabad City, which have also given satisfaction. It has now been decided by the Nizam's Government to construct further concrete roads, on the recommendation of Sir M. Vishweshwarayya, who recently investigated the proposal at the State's request. Engineers in other provinces are also getting interested, and a larger Indian consumption of cement is anticipated.

An Encouragement to Tobacco

The question of encouraging tobacco manufacture in India was recently considered by the Imperial Council of Agricultural Research, in view of the better prices that tobacco obtained in comparison with other crops in the present state of agricultural depression. There are about one million acres of tobacco grown in the various provinces of India, and the Government of Bengal asked for the appointment of a cigar curing and blending expert. So far as Madras Presidency was concerned, it appeared that the problem of greater importance was research in the growing of a tobacco which would be useful as a wrapper. In the end, the Imperial Council has decided that Provincial Governments should submit to them what kinds of particular research in tobacco are required to meet their particular needs.

Tariff Changes

AUSTRIA.—An Order has been issued, dated July 24, and effective as from July 28, which fixes the import duty on copper sulphate (ex Tariff No. 503) at 8 gold kronen per 100 kilos. For copper sulphate and preparations of copper for combating plant disease there is a conventional duty of 3·60 gold kronen per 100 kilos.

POLAND.—The following items occur in a list of articles subject to reduced import duty by virtue of an Order dated June 22, applicable to imports during the period July 1 to December 31, 1931 :—

Tariff No. and Article.		Percentage of Normal Duty Payable.
ex 96 (3) (a)	Precipitated sulphate of baryta (permanent white) for the manufacture of chalk paper	25
ex 102 (1)	Barium peroxide	20
ex 108 (4) (a)	Concentrated nitric acid (over 40° Beaumé) ; nitrose (mixture of nitric and sulphuric acids)	75
ex 112 (25) (b)	Potassium permanganate for industrial purposes	20
ex 112 (25) (c)	Organic chemical products not separately specified (in the Tariff), used as chemical reagents for the treating of zinc ores.....	10
117 (6)	Wood oil	15
ex 119 (4)	Benzaldehyde for the manufacture of synthetic dyestuffs	15

By an Order, dated June 22 and effective as from July 29, the Customs duties on the following articles on importation into Poland have been increased as shown :—

Tariff No. and Article.		Import Duty. Former.	New.
		Zlote per 100 kilogs.	
52 (8)	Paraffin wax of all kinds	48·10	75
84 (1)	Crude oil	10·40	15
100 (4)	Chromates, bichromates, perchromates of potassium and sodium ..	42·90	60
105 (2)	Ammoniacal and crystallised soda.....	6·50	15
108 (1)	Sulphuric acid, of any degree of concentration..	1·50	3
	NOTE.—Under permit from the Ministry of Finance	—	1·50
(2)	Fuming sulphuric acid (oil of vitriol) and anhydrous sulphuric acid	5·20	8
ex (6)	Formic acid	80·60	120
(7)	(*a*) Tartaric acid	169	220
	(*b*) Citric acid	130	220
112 (3) (a)	Liquid chlorine phosgen	32·50	60
ex 112 (17) (h)	Benzol chloride	17·20	60

A New Organic Acid Extracted from Apple Peel

DR. CHARLES E. SANDO, of the Bureau of Chemistry and Soils, Washington, is reported to have perfected a method for extracting ursolic acid, a new chemical from the waxlike coating of apple peels. By this method the compound is extracted from apple pomace. Ursolic acid appears to have promising possibilities for commercial use, chiefly in the paint and varnish industry. The fact that the powder is resinous to the touch and is water-repellent suggested its use in varnishes. Preliminary tests made by the American Paint and Varnish Manufacturers' Association show that it increases the gloss and water-resistance of cellulose lacquers. Another effect of adding small quantities of ursolic acid to lacquers is to extend the time required for drying, with consequent improvement in the brushing qualities of the lacquers so treated.

If there is sufficient demand for this new product, it is estimated that it will be possible to produce 500,000 lb. of ursolic acid annually, so far as the United States is concerned.

Commercial Intelligence

The following are taken from printed reports, but we cannot be responsible for any errors that may occur.

Mortgages and Charges

*[NOTE.—The Companies Consolidation Act of 1908 provides that every Mortgage or Charge, as described therein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every Company shall, in making its Annual Summary, specify the total amount of debts due from the Company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.]*

SILICATE CO., LTD., Hemel Hempstead. (M., 15/8/31.) Registered July 31, £400 debentures dated August 10, 1904, part of £500 ; general charge. *£2,600. June 22, 1931.

Satisfaction

ANGELA NITRATE CO., LTD., London, E.C. (M.S., 15/8/31.) Satisfaction registered July 30, all moneys, etc., registered July 24, 1930.

London Gazette, &c.

Company Winding Up Voluntarily

ACETATE PRODUCTS CORPORATION, LTD. (C.W.U.V., 15/8/31.) Creditors' claims to William H. Peat, K.B.E., 11, Ironmonger Lane, London, E.C.2, liquidator of the Corporation, by August 31.

New Company Registered

NATIONAL DRUG INDUSTRIES, LTD., P. and O. House, 14/15, Cockspur Street, London, S.W.1.—Registered as a "public" company on August 4. Nominal capital, £400 in 100 7½ per cent. cumulative preference, 100 7½ per cent. non-cumulative participating preference, 100 ordinary and 100 deferred ordinary shares, all of £1 each. Chemists, druggists, drysalters, importers and manufacturers of and dealers in pharmaceutical, medicinal, chemical, industrial and other preparations, etc. Directors : A. J. Harvie and A. J. Tibbitt.

Rayon Consumption

BRITISH consumption of rayon yarn based on the excise returns is showing steady recovery from the slump which reached its height during April, 1930, when, owing to uncertainty regarding the Budget, consumption fell to 2,817,000 lb. According to advance details, the amount excised in June this year was 4,341,000 lb., being the highest since October last year. As the export trade is now very small, it is apparent that the actual home consumption is greater. Actually in the second quarter of this year, consumption was greater than in the corresponding period of any other year.

Italian Production of Alcohol

ITALIAN production of alcohol in 1930 totalled 499,826 hectolitres (in terms of anhydrous alcohol) as compared with 499,132 hectolitres in 1929. Of the 1930 output, 354,683 hectolitres were produced from waste in the manufacture of sugar. Although ethyl alcohol consumed for beverage purposes dropped from 208,219 hectolitres in 1929 to 157,568 hectolitres in 1930, industrial consumption increased from 260,986 hectolitres in 1929 to 320,911 hectolitres in 1930.

Use of Lead Pigments Restricted in Spain

THE Provisional Republic of Spain has recently issued a regulatory law governing the use of white lead and lead sulphate in paint. White pigments containing a maximum of 2 per cent. of lead metal are allowed for certain purposes. Only in exceptional cases is the use of a higher lead content permitted. In addition the law provides for special precautionary measures to be employed in the manufacture and use of such pigments.